

EXHIBIT 40

1 KOENIGSHOFER

2 UNITED STATES DISTRICT COURT

3 DISTRICT OF MINNESOTA

4 -----
5 In Re:

6 Bair Hugger Forced Air Warming

7 Products Liability Litigation

8 This Document Relates To:

9 All Actions MDL No. 15-2666 (JNE/FLN)

10 -----
11 VIDEOTAPED DEPOSITION DANIEL KOENIGSHOFER, P.E.

12 Chapel Hill, North Carolina

13 June 13, 2017

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24 Randi J. Garcia, RPR

25 Job no. 124784

KOENIGSHOFER

June 13, 2017

9:12 a.m.

Videotaped Deposition of DANIEL
KOENIGSHOFER, P.E., taken by Defendants at
Regus, 1340 Environ Way, Chapel Hill, North
Carolina, before Randi J Garcia,
Registered Professional Reporter, and
Notary Public in and for the State of
North Carolina, on June 13, 2017,
beginning at approximately 9:12 a.m., when
were present on behalf of the respective
parties:

KOENIGSHOFER

APPEARANCES:

FOR THE PLAINTIFFS:

BY: GABRIEL ASSAAD, ESQUIRE

KENNEDY HODGES

4409 Montrose Boulevard

Houston, TX 77006

and

BY: GENEVIEVE ZIMMERMAN, ESQUIRE

MESHBESHER & SPENCE

1616 Park Avenue South

Minneapolis, MN 55404

BY: BEN GORDON, ESQUIRE

LEVIN PAPANTONIO THOMAS MITCHELL

RAFFERTY & PROCTOR

316 South Baylen Street

Pensacola, FL 32502

FOR DEFENDANT 3M and ARIZANT:

PETER GOSS, ESQUIRE

BLACKWELL BURKE

431 South Seventh Street

Minneapolis, MN 55415

ALSO PRESENT:

JULIUS BOLTON, VIDEOGRAPHER

I N D E X

WITNESS: DANIEL KOENIGSHOFER, P.E.

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THE VIDEOGRAPHER: This is the start of tape labeled number 1 of the videotaped deposition of Dan Koenigshofer in the matter of Bair Hugger Forced Air Warming Products Liability.

This deposition is being held in Chapel Hill, North Carolina on June 13, 2017 at approximately 9:12 a.m.

My name is Julius Bolton. I'm the videographer. The court reporter is Randi Garcia.

Will counsel please introduce yourselves for the record.

MR. GOSS: Peter Goss for 3M and Arizant.

MS. ZIMMERMAN: Genevieve Zimmerman for the plaintiffs.

MR. ASSAAD: Gabriel Assaad for the plaintiffs.

MR. GORDON: Ben Gordon for the plaintiffs.

DANIEL KOENIGSHOFER, P.E., after having been first duly sworn, was examined and testified as follows:

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EXAMINATION

BY MR. GOSS:

Q. Good morning, Mr. Koenigshofer.

A. Morning.

Q. We met briefly. My name is Peter Goss. I'm here to ask you some questions on behalf of the defendants in this case.

Can you just state your full name for the record, please.

A. Daniel Robert Koenigshofer.

Q. Have you given a deposition before?

A. One other time.

Q. And when was that?

A. 2008.

Q. What kind of a case was it?

A. Medical.

Q. Were you testifying as a --

A. A plaintiff.

Q. -- as a fact witness or an expert witness, if you understand the difference?

A. I don't know if I understand the difference, to tell you the truth. I went and did field work and wrote a report, then was deposed and it was settled out of case -- I

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mean, out of court.

Q. So were you retained by the lawyers for one of the parties?

A. Yeah.

Q. Okay. Have you ever testified in a legal matter other than that one time?

A. Divorce. Does that count? That was pretty stressful.

Q. I'm sure. So other than a divorce and this one other case, any other testimony by deposition or at trial?

A. No.

Q. All right. So since it's been about 10 years since your last deposition, I'll just go over some of the ground rules quickly, refresh your recollection.

First of all, for the benefit of the court reporter, we need to make sure we don't talk over one another. My delivery can be somewhat slow, especially when I'm operating on not as much sleep as I would like. You will know where my question is going, but I would just that ask that you not interrupt. Wait till I finish the question before you answer

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and I will do the same for you. I will make sure I don't step on any of your answers.

Because the court reporter is taking down a written record, we need to make sure to answer questions verbally, and not with gestures or uh-huh or hmm-hmm. That way, we get a clear written record.

You may at any time ask me to rephrase a question if you don't understand it or if it's unclear. It's likely to happen at least a couple of times over the course of the day. But if you answer a question, I'm going to assume that you understood it. Is that fair?

A. Mmm-hmm. Yes.

Q. All right. Thank you. And then we've already commented on the heat in the room. We've got the door open in order to mitigate that somewhat, but if at any point you need to take a break, just let me know. That's no problem.

A. Okay.

(Thereupon, Exhibit 1 was marked for identification.)

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1 KOENIGSHOFER
 2 BY MR. GOSS:
 3 Q. I've shown you what the court
 4 reporter has marked as Exhibit 1 to your
 5 deposition. It's a subpoena and a notice of
 6 deposition.
 7 Have you seen this before?
 8 A. Is this the list of stuff I'm
 9 supposed to bring? Yes.
 10 Q. Okay. So you're referring to
 11 Exhibit A. There's a list of 19 items that we
 12 asked you to bring. And did you gather
 13 materials that are responsive to these 19
 14 requests?
 15 A. Yes, we did.
 16 Q. And when you say "we," you and who
 17 else?
 18 A. And Gabe and Jim.
 19 Q. Okay. And I was provided a couple of
 20 binders here. Are these materials that you put
 21 together in response to this list?
 22 A. Yes.
 23 MS. ZIMMERMAN: And Counsel, for your
 24 convenience, we did Bates label.
 25 MR. GOSS: Okay. Oh, I see now.

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1 KOENIGSHOFER
 2 Okay.
 3 MS. ZIMMERMAN: I should know it, but
 4 I don't remember all the pages. So it
 5 starts with his initials on number one, it
 6 looks like, with that first --
 7 MR. GOSS: Okay.
 8 MS. ZIMMERMAN: -- what you have in
 9 front of you and then this will be the
 10 second.
 11 BY MR. GOSS:
 12 Q. All right. So let's spend a little
 13 time going through these. Are they organized
 14 in any particular way?
 15 A. Well, I don't know, to be honest. I
 16 mean, my binders are.
 17 Q. Okay. So that is -- you have another
 18 binder over there. What's the difference
 19 between that binder and these?
 20 A. Well, these are a whole bunch of
 21 articles that I've collected, some of which I
 22 have not even read yet.
 23 Q. Okay. Have you read everything
 24 that's in these two binders?
 25 A. Well, I've -- I've certainly looked

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1 KOENIGSHOFER
 2 at everything that's in those two binders, yes.
 3 Did I study it exhaustively? Not all of it.
 4 Q. All right. So how are these
 5 materials organized?
 6 A. The materials that you have right in
 7 front of you, I do not know how they are
 8 organized. We pulled out a whole bunch of
 9 stuff that was responsive to your requests and
 10 we took it up to FedEx and they copied it in
 11 piles and threw them in two different binders.
 12 Q. Got it.
 13 A. I would assume it's RAM.
 14 Q. Random access?
 15 A. Yes.
 16 Q. Understood. All right. So if we can
 17 go down the list.
 18 A. Okay.
 19 Q. So the first thing we asked for, "All
 20 documents reviewed by the deponent in
 21 anticipation of or in preparation for this
 22 deposition."
 23 So that would be these two binders;
 24 correct?
 25 A. Yes.

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1 KOENIGSHOFER
 2 Q. Would it also include that binder?
 3 A. Not everything in this binder. A lot
 4 of the stuff that's in this binder is in those
 5 binders. I went through this and checked off
 6 the stuff that I used. And all the things that
 7 were checked are there.
 8 Q. All right.
 9 A. Things that are not checked are not
 10 there.
 11 MR. GOSS: So I think what I want to
 12 do is mark these two as an exhibit. So I
 13 guess we'll call it 2 and 3?
 14 MS. ZIMMERMAN: I think everything in
 15 this binder should appear in these two
 16 binders. He does have some notes,
 17 highlights and things like that in his own
 18 binder.
 19 MR. GOSS: So yeah, that's -- I'll
 20 want to get a copy of that. I don't know
 21 how you want to do this. Put it on the
 22 cover. Mark his as 4.
 23 (Thereupon, Exhibit 2 was marked for
 24 identification.)
 25 (Thereupon, Exhibit 3 was marked for

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1 KOENIGSHOFER
 2 identification.)
 3 (Thereupon, Exhibit 4 was marked for
 4 identification.)
 5 MS. ZIMMERMAN: Normally when you
 6 mark an exhibit, she's going to take it
 7 with her, right?
 8 MR. GOSS: Or she can copy it.
 9 MS. ZIMMERMAN: I think that
 10 Mr. Koenigshofer would prefer that at
 11 least for this binder in front him with
 12 his handwritten or his highlights and
 13 things like that, that a copy be made so
 14 that he can keep the original.
 15 MR. GOSS: Sure. But I was thinking
 16 we would just use what he's got until we
 17 have time to make a copy later.
 18 MS. ZIMMERMAN: That's fine. And
 19 these are not Bates labeled.
 20 MR. GOSS: That's fine. Could you
 21 put a 4 on his and then we'll replace --
 22 we'll replace it when you make a copy or
 23 when somebody does.
 24 BY MR. GOSS:
 25 Q. All right. So the second thing

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1 KOENIGSHOFER
 2 requested on this list is correspondence and
 3 documents between you and nonlawyers. Is there
 4 any correspondence of that nature?
 5 A. There's not, no.
 6 Q. All right. Copies of notes related
 7 to your work. Exhibit 4 is your binder. Do
 8 you have notes in there?
 9 A. Some, but we also provided you
 10 with -- I have a little notebook that I use.
 11 Q. Okay.
 12 A. So we provided you with copies of
 13 that notebook someplace in those binders.
 14 Q. It's in 2 or 3?
 15 MR. ASSAAD: It's in 3 at the end.
 16 BY MR. GOSS:
 17 Q. Okay. Any other notes than what is
 18 in Exhibits 2, 3 and 4?
 19 A. No.
 20 Q. Fourth item is copies of documents
 21 you received from plaintiff's counsel on which
 22 you've have made notes or highlighting. Were
 23 there any such documents?
 24 A. Well, I did provide some of these
 25 articles, too.

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1 KOENIGSHOFER
 2 Q. And you have some that you've marked
 3 up?
 4 A. Yeah, some. Yes.
 5 Q. And those are in either 2, 3 or 4?
 6 A. Either 2, 3 or 4, yes, if you include
 7 this. Yes.
 8 Q. 6 and 7. So 6 asks articles or
 9 treatises that you have authored or coauthored.
 10 I'm obviously familiar with some of the stuff
 11 that you have written. And are there any
 12 articles in this collection that you wrote?
 13 A. No. I don't think so.
 14 Q. 7 asks for materials you consider
 15 authoritative with regard to your opinions.
 16 Key documents, if you will. Have you included
 17 any of the references on which you rely for
 18 your opinions in this collection? 2, 3 or 4?
 19 MS. ZIMMERMAN: I just want to enter
 20 an objection to that. It's overly broad.
 21 His report certainly notes those papers
 22 that he relies upon in the report, but an
 23 exhaustive list of every potential
 24 authoritative text, be it an article or a
 25 treatise or a book, would just be

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1 KOENIGSHOFER
 2 absolutely too burdensome for us to
 3 prepare.
 4 MR. GOSS: Understood.
 5 BY MR. GOSS:
 6 Q. Have you included any copies of
 7 articles that you rely on for your opinions in
 8 this case?
 9 A. I have not.
 10 Q. I have a copy of your resume, which
 11 was attached to your report. Have there been
 12 any changes to that resume since you drafted
 13 the report?
 14 Do you have a more current version?
 15 A. I mean, nothing of significance.
 16 I've given a couple more presentations, but I
 17 give them all the time.
 18 Q. Do you have with you a more current
 19 version of your resume than what you provided
 20 with your report?
 21 A. No, I don't. Again, that resume was,
 22 what, March?
 23 Q. Right. So number 9 asked for your
 24 engagement agreement, if any.
 25 A. I believe that's in there.

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1 KOENIGSHOFER
 2 Q. Okay. Do you have any idea where it
 3 is?
 4 A. Talk to Gabe.
 5 MR. ASSAAD: I'm sorry, what was the
 6 question?
 7 MS. ZIMMERMAN: Engagement agreement.
 8 MR. ASSAAD: I'll tell you.
 9 MS. ZIMMERMAN: I think there may be
 10 one extra copy in here as well.
 11 THE WITNESS: I would think it's more
 12 likely to be around this miscellaneous
 13 stuff.
 14 MR. ASSAAD: It's going to be in the
 15 second binder.
 16 THE WITNESS: Toward the back, maybe.
 17 MR. ASSAAD: So it'll be more in the
 18 front.
 19 BY MR. GOSS:
 20 Q. All right. Well, it's in there
 21 somewhere. I'm not going to worry.
 22 MR. ASSAAD: I'll look for it. I'll
 23 give you the page number when I find it.
 24 Is that fair?
 25 MR. GOSS: That's fine.

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1 KOENIGSHOFER
 2 A. Twenty-five to \$30,000.
 3 Q. Okay. What was the date of your most
 4 recent invoice, if you can recall?
 5 A. It was probably sent on May 1st, I
 6 would think. I don't think I billed for May.
 7 I don't think I did much in May.
 8 Q. May 1st of this year?
 9 A. Yes. May 1st, '17.
 10 Q. Do you remember what the amount was
 11 roughly?
 12 A. It was around 16,000, 15,000,
 13 something of that order of magnitude, including
 14 expenses.
 15 Q. What were your expenses for that
 16 invoice?
 17 A. I went to Minneapolis.
 18 Q. When did you go to Minneapolis?
 19 A. Mid March. March 16, something like
 20 that.
 21 MS. ZIMMERMAN: Counsel, if it's
 22 helpful, the invoices we think appear at
 23 Bates number 1444, 1445 and 1449.
 24 MR. GOSS: Okay. Thank you.
 25 MR. ASSAAD: Easy to refer to.

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1 KOENIGSHOFER
 2 BY MR. GOSS:
 3 Q. Invoices for your work in this case,
 4 have you included copies of those?
 5 A. Yes.
 6 Q. Would that be somewhere near where
 7 the engagement agreement is?
 8 A. I would think so. I would think so.
 9 Q. How many invoices have you issued in
 10 this case?
 11 A. I want to say three.
 12 MR. ASSAAD: Invoices are on page 81.
 13 BY MR. GOSS:
 14 Q. Page 81, there's an invoice. Looks
 15 like Invoice Number 2. And the amount of that
 16 one is \$2273. I'm not seeing other invoices
 17 around that.
 18 Let me just ask, what is the total
 19 amount that you've invoiced the plaintiffs for
 20 your work on this case? Doesn't have to be
 21 exact.
 22 A. That's 2500?
 23 Q. 2700. No, I'm sorry, 22. 22.
 24 A. Probably in the range of 25 to 30.
 25 Q. Thousand?

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 2 MR. GOSS: Yeah. All right. Okay.
 3 BY MR. GOSS:
 4 Q. So when were you first retained by
 5 plaintiff's counsel in this case?
 6 A. I think it was April 16.
 7 Q. April of 2016?
 8 A. Yes.
 9 Q. And who was it who called you?
 10 A. I think Ben Gordon made the first
 11 contact with me.
 12 Q. Okay. So the meeting in Minneapolis
 13 in March, you had meetings with counsel,
 14 obviously; correct?
 15 A. Yes.
 16 Q. Did you meet with anybody other than
 17 the lawyers for the plaintiffs in this case?
 18 A. No.
 19 Q. Going back to the list here. Item
 20 number 12 asks for correspondence with people
 21 other than plaintiff's counsel. Do you have
 22 any correspondence?
 23 A. I do not.
 24 Q. Okay. On 14, there's a list of names
 25 there. Obviously, if you don't have

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correspondence with people other than plaintiff's counsel, you're not going to have correspondence with these folks. But I just want to ask you if you've spoken to anyone whose name appears under item 14?

A. No.

Q. Fifteen, I asked if you've spoken to Scott Augustine. Have you spoken to Scott Augustine?

A. No.

Q. Do you know who Scott Augustine is?

A. Well, in general terms, but I don't know him.

Q. Okay. What's your understanding of who Scott Augustine is?

A. Well, I think he's the guy that initially invented the Bair Hugger.

Q. 16 mentions Randy Benham. Have you spoken to Randy Benham?

A. No.

Q. 17, I had some additional names. Brent Augustine, Sue Augustine, Garrett Augustine, Ryan Augustine or any employee or agent of Augustine Biomedical. Have you spoken

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to any of those folks?

A. No.

Q. 18 asks for any study, test, trial, experiment. This is the kind of thing only a lawyer could love; right?

A. Got it.

Q. It's a long list. Basically asks you for any experimentation that you've done on the Bair Hugger Warming System. Do you have any documents related to any experiments you conducted on a Bair Hugger?

A. No.

Q. Number 19 is all documents sent to or received from any forced-air warming system manufacturer about the alleged or potential hazards of forced-air warming.

Do you have any correspondence or documents from any forced-air warming manufacturer other than 3M and Arizant?

A. Well, I've downloaded stuff from the internet from Mistral.

Q. Okay. Have you included that in this collection, Binders 2 and 3?

A. I believe so.

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Q. Anyone besides Mistral? Any devices besides Mistral?

A. No. I don't think so. Bair Hugger.

Q. Right. That's obviously what we're here to talk about.

A. Well, I did Google them.

Q. All right. Well, that's -- I have to.

A. You wouldn't want a dumb engineer.

MS. ZIMMERMAN: Counsel, just for the record, I didn't hear you ask about Number 11 on Exhibit A, which is all documents or other materials the deponent intends to show the jury in this case. And I just want to raise an objection to that. Certainly to the extent that the Court's ultimate scheduling order contemplates demonstratives and other exhibits, we will comply with that, but I don't want this -- the failure to talk about it or raise that objection now to be seen as a waiver.

MR. GOSS: I understand that. That's why I didn't bring it up, knowing that that objection would be there, but that is

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understood.

MS. ZIMMERMAN: Thanks.

BY MR. GOSS:

Q. Okay. Now, I don't really want to belabor this, but I kind of want to go through -- maybe I'll go through these during a break. That will take less time, Exhibits 2 and 3. And then I'll see if I have other questions about what's here.

A. Okay.

MR. GOSS: But for now, we'll move on. (Thereupon, Exhibit 5 was marked for identification.)

BY MR. GOSS:

Q. So Exhibit 5 is a copy of your expert report and Exhibit A in this matter. Does that look correct?

A. Yes. I see you've got a short form contract attached to the back. But that's where it is.

Q. Okay. And that, I think, was attached to the copy of the report that I got, as an exhibit.

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A. Okay.

MS. ZIMMERMAN: It was, because the rules contemplate providing information about your hourly rate and that sort of thing.

BY MR. GOSS:

Q. Right. And as long as we're on it, if we can go over this quickly. This is the back page here. The expert witness short form contract says your hourly rate is \$300 an hour; correct?

A. Yes, sir.

Q. Your rate is slightly higher for depositions, at 350 an hour; correct?

A. Yes.

Q. And court time is 400 an hour?

A. Yes.

Q. This mentions, under expenses, the last bullet is "obtain PE license in another state." Have you had to do that for this case?

A. No.

Q. If you turn to a couple pages in from that where it says Exhibit A, this is your resume. And I think you said earlier that this

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was current as of March; is that right?

A. Yes. I'd say so. As far as significant events, yes.

Q. So your education. You received a bachelor of science in physics with a minor in meteorology from UC Davis in 1971; is that correct?

A. Yes, sir.

Q. I was living in Davis right about that time.

A. Were you really?

Q. Yeah. I was born in Woodland in 1969.

All right. And then from -- after you completed your work at UC Davis, did you go straight to your master's in public health?

A. No.

Q. What did you do after your undergrad?

A. I moved to St. Paul, Minnesota, where I worked for an air pollution consulting firm for a year.

Q. What company was that?

A. Pollution Curbs Incorporated.

Q. What sort of work did you do for

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them?

A. I was a stack sampler.

Q. So you went to factories or manufacturing facilities that had stacks that emitted contaminants; is that right?

A. Yes. So we did coal-fired power plant for Northern States Power at the time. I don't know what they're called now. White Industries made refrigerators and appliances, and a sulfuric acid plant, and a multi-mill over in Wisconsin. All kinds of fun things. It was fun, actually.

Q. And so your role as a stack sampler was to measure what was coming out of the stacks; is that right?

A. Yes. So we would go over there with various instruments. And if we needed to drill holes in the stacks that weren't already there, we would do that. Stick probes in there. Do isokinetic sampling of the air, take it through filtration or Anderson samplers or whatever we were, in particular, looking for. Then I was also the scientist and I took all that stuff back to our little lab. It was a small

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company, about eight people. So I'd go back to the lab and do lab analysis and then write up the report and move on.

That was my job. It's a tough job in the middle of winter in Wisconsin. Well, Wisconsin or Minnesota.

Q. I forgot to ask you, in your undergrad, you have -- you got a degree in physics and meteorology; correct?

A. Yes.

Q. Did you have any engineering coursework as part of your undergraduate degree?

A. No.

Q. What motivated you to pursue an MPH?

A. Well, the School of Public Health at UNC is a very famous program. I got accepted to there and Harvard and Colorado and Oregon, but UNC offered me the most money, plus it was -- really, at the time, it was equal to Harvard at the time and maybe still is. But it was in air pollution, so I was going to -- air pollution engineering was going to be my career.

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2 Q. So your MPH program, did it include
3 engineering as part of your coursework?

4 A. Yes. So it's a little-known fact
5 that the UNC School of Environmental
6 Engineering actually is a ABET-approved program
7 for engineering. Very few people know that.
8 They think all engineers in the state have to
9 go to NC State. But anyway, so I went there.

10 I took classes that were called like
11 particle physics, water, chemistry, air
12 chemistry, optics, meteorological modeling, air
13 pollution control, occupational safety,
14 environmental law, city planning. It was a
15 two-year program.

16 Q. Your focus throughout the program was
17 on air pollution; is that right?

18 A. Yes.

19 Q. During your program, did you have any
20 exposure to medical device design?

21 A. No.

22 Q. You list under your education, your
23 licenses and registrations as a professional
24 engineer; correct?

25 A. Uh-huh. Yes.

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2 Q. You've got licenses for North
3 Carolina, Virginia and South Carolina. Are
4 those all current?

5 A. Actually, I've let my licenses in
6 South Carolina -- and I don't know about
7 Virginia, but for sure South Carolina, I've let
8 that lapse. I just wasn't using it.

9 Q. And then you have a certification
10 from ASHRAE.

11 A. Yes.

12 Q. As a certified healthcare designer;
13 correct?

14 A. Yes.

15 Q. Does that have to be renewed at any
16 point?

17 A. You've got to show continuing
18 education stuff and send them money.

19 Q. Do you have any licenses or
20 certifications that aren't reflected on this
21 resume?

22 A. No.

23 Q. Tell me a little about what you did
24 after you received your MPH from UNC.

25 A. Okay. I went to work for the EPA in

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2 the energy strategies branch here in Durham,
3 North Carolina, where I worked on policies
4 related to air pollution from combustion, so in
5 particular, coal-fired combustion, but also
6 canning industry. One other I can't remember.
7 You get the idea.

8 So it was kind of the crossover of
9 energy use, and, you know, usable things that
10 people need: Cans, electricity. And so we
11 would investigate the best ways to try to
12 reduce air pollution from power plants,
13 coal-fired power plants, scrubbers, bag houses,
14 and write policies that we attempted to balance
15 those two things. This was in the early days
16 of the Clean Air Act.

17 Q. So would this have been in the late
18 '70s?

19 A. This was in the -- yes, mid '70s. So
20 this would have been '75/'76.

21 Q. How long did you stay with EPA?

22 A. Just a year. I decided I wasn't cut
23 out to be a federal employee.

24 Q. What did you do after that?

25 A. Well, I started doing solar energy

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2 consulting with the thought that I was going to
3 move back to California. But my wife at the
4 time had just gotten a nice new job and she
5 wanted to stay a little while and things had
6 started to roll a little bit with my little
7 one-man consulting firm.

8 So I was doing solar energy hot water
9 systems and things like that, designing them
10 and installing them with, you know, some
11 licensed contractor friends of mine.

12 Q. How long --

13 A. And then we started the business.
14 And then just -- well, it grew.

15 Q. So you had a one-man consultancy and
16 then it grew?

17 A. Uh-huh.

18 Q. So you brought in some partners?

19 A. Well, yeah. Yes, I would say so. I
20 started in '76 as Integrated Energy Systems,
21 was the name of the company. I guess my first
22 partner, I brought in around '80, '82. And he
23 went to be very successful in some sort of
24 instrumentation business, robotics stuff.

25 Q. So how long did you keep your solar

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2 energy consulting business?

3 A. Well, it pretty quickly evolved to
4 you could not even in those days, even at
5 Chapel Hill, really support your habits in the
6 solar energy business. You very quickly ran
7 out of all the people who were willing to put
8 solar energy things on their houses, even
9 though it didn't make sense. There are a
10 certain number of those people in the world and
11 a lot of them live here in Chapel Hill. But
12 there's still a limited supply.

13 So I actually started doing energy
14 conservation, energy auditing for schools and
15 hospitals.

16 Q. When did you do that?

17 A. Oh, gosh, let's just say '80,
18 something like that. We were doing both, so we
19 were -- at that time, somewhere along the way,
20 I hired architects to work for me. And so we
21 were designing and building solar houses. And
22 then also doing the energy audits for schools
23 and hospitals.

24 That was a federal program, grant
25 program. I suppose -- what would that be,

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2 maybe Jimmy Carter days? Maybe about 1980?

3 Anyway, so they would give grants to
4 schools and hospitals for energy audits and
5 then implementation of energy conservation
6 stuff. So I did that throughout the '80s.
7 That evolved into we were doing energy audits
8 for the military. So we did energy audits at
9 Fort Benning, Fort Knox, Fort Bragg, Biloxi Air
10 Force base and so forth throughout the '80s.

11 And then around 1990, we decide -- I
12 had another partner at the time now -- actually
13 still sort of is my partner. So we started
14 to -- well, we changed the name of the company
15 from Integrated Energy Systems to IES
16 Engineers. And so throughout the '90s, then we
17 did HVAC design for hospitals and laboratories.
18 Higher ed stuff.

19 Q. So before the 1990s, did any of your
20 work involve either energy audits or design of
21 HVAC systems for hospitals?

22 A. Oh, yes. That is what we were doing.

23 Q. Before the 1990s?

24 A. Yeah, yeah, sure. That's what we
25 were doing throughout the '80s. I mean --

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2 Q. Okay.

3 A. I mean, if you're going to do an
4 energy audit on a hospital, you're looking at
5 the HVAC system. 65 percent of the hospital
6 energy use is the HVAC system.

7 Q. So when did you first start doing
8 work with hospitals?

9 A. '82. We became kind of the
10 military's hospital geeks by the, I don't know,
11 '86, '88. So we were doing energy audits on
12 multiple military hospitals. So when I say
13 Fort Benning/Fort Knox, I should have clarified
14 that. That was the hospitals at those
15 facilities. Ireland Army Hospital, that's in
16 Fort Knox. Air Force Regional Medical Center
17 was in Biloxi. I can't remember the hospital
18 name in Georgia, Fort Benning. Anyway, I could
19 find all that if you were so inclined.

20 Q. That's fine.

21 So by the 1990s, you transitioned
22 all -- essentially all of your business to
23 hospital design and energy audit; is that
24 correct?

25 A. No. In 1990, we transitioned really

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2 from energy audits to design for labs and
3 hospitals. And then in 2000, we said, you know
4 what, hospitals are more interesting. So from
5 2000 on, that's all I've done is hospitals.

6 Q. When did you first get involved with
7 ASHRAE?

8 A. Around 2004, because I saw -- I was a
9 member of ASHE. Do you know what ASHE is?

10 Q. Let's go ahead and break it down and
11 explain what ASHE is.

12 A. Okay. ASHE is the American Society
13 of Hospital Engineers. And it's a part of AHA,
14 which is the American Hospital Association or
15 Health Association, or whatever -- whatever the
16 H in AHA stands for. So anyway, it's a subset
17 of that. So I had been a member of the
18 American Hospital Association -- well, it's
19 called ASHE, is the way they pronounce it, so
20 for the record there.

21 Q. ASHE?

22 A. ASHE is American Society of Hospital
23 Engineers. Since mid '80s.

24 So I started going to North Carolina
25 chapter meetings and then started going to the

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national meetings. And so it's through that organization that I heard that ASHRAE, the American Society of Heating Refrigeration Engineers. Did I say them all? Air conditioning, heating, refrigeration engineers, something like that. I know I should know that. Anyway, so I read on the ASHE newsletter, stuff that ASHRAE was going to write a code -- well, at least a guideline for ventilation in hospitals.

So I said to myself, that is really important. I want to be involved. So I started going to the ASHRAE meetings and raising my hand and getting on committees.

And they had already drafted -- I think the first version of that was already done by the time I got involved, but I've been involved with it since, I don't know, say 2007, something like that.

Q. Going back to ASHE. Have you ever held any offices within the ASHE organization?

A. Well, I was on a commissioning subcommittee or advisory group, something or other, and I have been awarded a -- the status

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of senior member of ASHE, which is not just because you get old, but it's because you've published and you've been involved in -- on committees and so forth. So it's activity within the group.

So they give out probably three or four of those a year. It's a pretty big deal. So at a meeting of 2- or 3000 people, the two or three people that are awarded a -- they call it SASHE.

Q. Is there a sash that goes with the SASHE?

A. I didn't get a sash with the SASHE, but that's not a bad idea. So anyway, I was awarded the SASHE, whatever, designation, I guess you could call it.

Q. So you mentioned that ASHRAE was working on a guideline for ventilation in hospitals. Is there a similar guideline that ASHE prepared?

A. No.

Q. What was the guideline -- did the guideline that ASHRAE was working on have a particular name that you can recall?

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A. It's Standard 170, ventilation in healthcare facilities.

Q. And you understood that by the mid 2000s, they already had a version of that?

A. Yes.

Q. You mentioned your publications. I'm going to show you a list that I received yesterday.

(Thereupon, Exhibit 6 was marked for identification.)

BY MR. GOSS:

Q. There's a front and back to this list. To your understanding, is this a complete list of your publications in the last 10 years?

A. Yes.

Q. All right. Not everything on this list is something that you actually wrote; correct?

A. That's correct.

Q. Okay. So some of these things are interviews; is that right?

A. Yeah. Especially all these ones at the top there, with Turpin, so she's the editor

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of this newsletter, I guess you could call it, magazine. So she calls me every once in a while and talks to me extensively about these things.

So if you chase down those articles, you'll see that, you know, it's basically an article about me. She wrote it. But...

Q. There's a -- number 6 is the ASHRAE HVAC Design Manual for Hospitals and Clinics; correct?

A. Yes.

Q. And you were the editor for that book; correct?

A. I was the editor and, you know, one of the main authors.

Q. Okay. And I believe you contributed to a couple chapters of the book; right?

A. Right. Well, as the editor in chief, I was responsible for reading every word in the whole book.

Q. Okay. But as far as material that you authored, which --

A. All of Chapter 2. And, I don't know, at least half of Chapter 8. It was a volunteer

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group. And like any volunteer group, you know, in the beginning, dozens of people raise their hands and in the end, a half a dozen are doing all the work. And in the end of the end, one takes it across the finish line.

Q. Okay. So you said you wrote all of Chapter 2. Were there other contributors to Chapter 2?

A. Well, not really, but yes, you've done your homework. I gave credit to a guy who was supposedly going to write Chapter 2 and failed me miserably, but -- so I didn't use anything that he did, but I gave him partial credit, just because it wasn't worth the trouble of having an argument.

(Thereupon, Exhibit 7 was marked for identification.)

BY MR. GOSS:

Q. All right. So Exhibit 7 is just a cover of your book. And then on the inside page, there's a list of contributors.

A. Yeah.

Q. All right. Near the top of the masthead is the editor and author of Chapters 2

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and 8. Chapter 2 is the -- is the chapter on infection control; is that right?

A. Yes.

Q. Okay. And then it looks like Traci Hanegan is given some credit for Chapter 2?

A. She has, yeah. Yeah.

Q. What did she contribute to Chapter 2?

A. Oh, gosh. I don't remember much of what Traci contributed. She contributed a lot to 8. You know, I couldn't say without the book here in front of me. I could probably find a paragraph or two that she might have written. It would take me a while to ferret that out, but I could do that.

(Thereupon, Exhibit 8 was marked for identification.)

BY MR. GOSS:

Q. So Exhibit 8 is a copy of Chapter 2?

A. Uh-huh.

Q. If you can easily identify -- well, why don't you take a look at it and see if you can identify what Traci Hanegan would have contributed.

A. Okay. And I guess you're going to

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ask the same question about Jeff?

Q. Jeff Hardin?

A. Yeah.

Q. Yes, sir.

MS. ZIMMERMAN: I suspect counsel would ask that you not guess.

BY MR. GOSS:

Q. Yeah. No guessing.

A. Okay.

Q. If you have a recollection of who contributed or what parts Hanegan and Hardin contributed, that's all I would ask.

A. Well, I can say that one or the other of them wrote this on page 23 and 24, this endogenous and exogenous stuff.

Q. Okay. So you don't think you would have written that?

A. On 23 or 24?

Q. Let me re-ask my question.

To your recollection, did you write the bullet points at the bottom of 23, topic 24 on endogenous and exogenous sources?

A. I did not.

Q. Do you know or do you recall who did?

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A. It was either Hanegan or Hardin. Probably Hardin.

MS. ZIMMERMAN: And again, he's not asking you to guess.

THE WITNESS: I'm not supposed to guess. All right. Okay.

BY MR. GOSS:

Q. Okay. And what it says here just before the introduction of the bullet, it says, "There are two sources of infectious agents in a hospital or healthcare setting."

A. Where are you?

Q. On 23 right before the first bullet point, "endogenous source." And it says, "Endogenous source, the causative agent of the infection is present in the patient at the time of admission to the hospital, but there are no signs of infection. The infection develops during the stay in the hospital as a result of the patient's altered resistance or through introduction of microbes into normally sterile areas, such as insertion of an intravenous catheter into a vein or from a surgical procedure."

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Did I read that correctly?

A. Yes.

Q. I understand that you didn't write this, but do you agree with what's written there?

A. Yes.

Q. Second bullet is "exogenous source." It says, "Infection occurs from introduction of microbes into or on the patient from an outside source. For example, the patient may acquire infectious agents from the hands of staff or from contaminated equipment and subsequently develop an infection."

Do you have -- do you agree with that statement or those statements?

A. Yes, I do.

Q. Do you have an understanding with respect to surgical site infections of the percentage that are attributable to endogenous versus exogenous sources?

MS. ZIMMERMAN: I'm going to object to that question.

THE WITNESS: I don't know the answer to that question.

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BY MR. GOSS:

Q. Anything else in Chapter 2 that was contributed by Hanegan or Hardin that you can remember?

A. Figure 2.3 came from somebody else. I don't remember. That might have actually come from Frank Mills.

Q. Frank Mills is the third contributor --

A. Yes.

Q. -- to Chapter 2?

A. Yes.

Q. Is he the guy that failed you miserably?

A. Yes.

Q. And figure 2.3 is on page 26; correct?

A. Correct.

Q. And it's a diagram. The title of it is "Routes for Surgical Site Infections"; correct?

A. Yes.

Q. And it shows operating room air as one of five categories of sources of bacteria

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for surgical site infections; correct?

A. Yes.

Q. Anything else from other contributors in Chapter 2?

MS. ZIMMERMAN: That you can recall.

MR. GOSS: That you can recall.

MS. ZIMMERMAN: It might be nice to take a break some time soon.

BY MR. GOSS:

Q. Let's do Chapter 8 before we break.

A. Actually, a lot of the stuff on natural ventilation on page 28. That basically is -- those paragraphs right there about research in the UK, that was done by Frank Mills, who is British.

Q. All right. So that's on page 28?

A. 28, section 2.8. Frank wrote the words there. Of course, he did not do the table 2.3. So yeah, Frank pretty much wrote that whole section down to where it says 2.9.

Q. Okay. The section on filtration, is -- did you write that? 2.9?

A. I wrote everything on the page 29, yes. So that's it. Yeah.

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Q. Except for the chart by Frank Mills; right?

A. Yeah, section 2.9. Frank did 2.8.

Q. And you wrote 2.9?

A. Yes. Somebody, either Traci or Jeff, wrote at least the first paragraph on page 31 about dust mites. I think that's it.

Q. We'll do one more. Then we can take a break.

A. And, of course, we as a committee --

MR. ASSAAD: There's no question.

BY MR. GOSS:

Q. So let's pretend there was a question. What were you going to say?

A. I was just going to state the obvious, that as a committee, we met together and discussed all this stuff. So it's hard to exactly say who physically put the words in a paper. But close enough.

Q. With respect to Chapter 2, you had contributors to that chapter?

A. Sure, but each of us in the end was responsible for a section.

(Thereupon, Exhibit 9 was marked for

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2 identification.)

3 Q. All right. So Chapter 8, again, you
4 had other contributors to that as well;
5 correct?

6 A. That is correct.

7 Q. All right. You've got Reg Brown.
8 Reg Brown is one of the contributors to
9 Chapter 8?

10 A. Yes.

11 Q. Traci Hanegan again is a contributor
12 to Chapter 8?

13 A. Yes.

14 Q. Nicholas Lemire?

15 A. Yes.

16 Q. Michael Meteyer?

17 A. Yes.

18 Q. And it looks like that's it. And
19 then, of course, you -- you contributed to
20 Chapter 8; correct?

21 A. Yes.

22 Q. All right. What portion of Chapter 8
23 did you write?

24 A. I wrote the introduction. I believe
25 that Nicholas did the room pressurization 8.2.

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2 He's Canadian. That's why you'll note that he
3 used scientific notation, about the only place
4 in the book that is there.

5 Q. What's unique about his Canadian
6 scientific notation?

7 A. Well, that's how I can tell that he
8 wrote it. But I remember that. He wrote that
9 stuff. I think it was somebody who works him,
10 actually, but anyway, it was not I.

11 Q. Who wrote the section 8.3 on
12 operating rooms?

13 A. I did.

14 Q. Did anyone else contribute to the --
15 to section 8.3?

16 A. No.

17 Q. That's all the questions I have about
18 Chapter 8 for the moment.

19 MR. GOSS: If we need to take a
20 break, let's go.

21 MS. ZIMMERMAN: That would be great.

22 THE VIDEOGRAPHER: Off the record,
23 10:14 a.m.

24 (Thereupon, a brief recess was taken.)

25 THE VIDEOGRAPHER: Start of Tape 2,

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2 back on record, 10:28 a.m.

3 BY MR. GOSS:

4 Q. All right. When we left off,
5 Mr. Koenigshofer, we were talking about your
6 publications. And if you'll pick up Exhibit 6
7 again, which is your list of publications the
8 last 10 years.

9 Chapter 2 of the HVAC design manual
10 addresses the subject of surgical site
11 infections; correct?

12 A. Yes.

13 Q. Do you have any other publications on
14 this list that discuss surgical site
15 infections?

16 A. Well, number four does.

17 Q. And that's an article that you were
18 quoted in; correct?

19 A. Yes.

20 Q. Do you have a copy of that with you?

21 A. No, I don't.

22 (Thereupon, Exhibit 10 was marked for
23 identification.)

24 BY MR. GOSS:

25 Q. This Exhibit 10, is that the same as

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2 reference four, article by Joanna Turpin from
3 November 3, 2014?

4 A. Yes.

5 Q. Two thirds of the way down the first
6 column, there's a heading, "HVAC and HAIs";
7 correct?

8 A. Yes.

9 Q. HAIs are hospital-acquired
10 infections?

11 A. Yes. Some people have said it's
12 hospital-associated infections, which is, I
13 think more politically correct.

14 Q. Okay. What's the difference between
15 acquired and associated?

16 A. I think it's one step removed.

17 Q. And that first paragraph says, "As
18 noted in ASHRAE's HVAC design manual for
19 hospitals and clinics 2013, the nature of
20 infectious pathogens, the modes of
21 transmission, the causation of infections and
22 the relationship to HVAC system design are
23 complicated and not fully understood."

24 Do you agree with that statement?

25 A. Yes.

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Q. And it says, "But most agree about 90 percent of HAIs are transmitted by direct contact with about 10 percent resulting from airborne transmission."

Do you agree with that statement?

A. Yes. I've seen publications anywhere from five to 20, but those are about 10.

Q. Going back to the question I asked earlier about endogenous and exogenous sources of surgical site infections, would the same percentage apply to infections from exogenous sources versus endogenous, meaning -- that's a bad question.

A. Yes.

Q. Would you say that approximately --

MS. ZIMMERMAN: I'm going to object --

MR. GOSS: Go ahead.

MS. ZIMMERMAN: I'll let you finish.

Then I'll jump in and then you can jump in.

BY MR. GOSS:

Q. Would you say that approximately 90 percent of hospital-acquired infections or

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associated infections result from endogenous sources?

MS. ZIMMERMAN: Object to the form of the question. Foundation. And misstates the prior testimony.

THE WITNESS: I couldn't answer that question anyway. I don't know the answer.

BY MR. GOSS:

Q. So are you saying there's a difference between infections transmitted by direct contact and infections from endogenous sources?

MS. ZIMMERMAN: Objection to form.

BY MR. GOSS:

Q. Or can you answer that?

A. I can't answer that question.

Q. Would you need microbiological expertise to answer that question?

MS. ZIMMERMAN: Object to form.

THE WITNESS: I would, yes.

BY MR. GOSS:

Q. And fair to say you're not a microbiologist?

A. Correct.

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Q. Any other publications on Exhibit 6 that relate to surgical site infections?

A. No.

Q. Have you written any articles on the potential for medical equipment to interfere with operating room airflow?

A. No.

Q. Have you written any articles specific to patient warming devices?

A. No.

Q. Let's go back to your resume, please. Exhibit A to the report. Let's see. The fourth paragraph talks about your hands-on engineering experience. And the last sentence says, "He has personally designed every discipline in healthcare engineering, including med gas, fire alarm, electrical, mechanical, sprinklers, HVAC, emergency power, et cetera."

And my question is: Have you ever designed a medical device?

A. No.

Q. The paragraph right above that mentions your previous role as an expert witness. And the case involved an infection

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from surgery; is that right?

A. Yes.

Q. What type of surgery was it?

A. Open-heart.

Q. What type of infection?

A. Fungal infection on the outside of the heart.

Q. And what field work did you do in that case?

A. I looked inside the air handler that served the space, and I looked in the ductwork that served the particular OR where the infection occurred. And then I looked inside the OR and inside the laminar diffuser.

Q. And when you say you looked inside, were you taking samples of anything?

A. Well, I was -- I was -- I didn't do any instrumentation at all other than temperature and humidity, well, and a Kleenex for pressurization. But when a piece of black insulation fell out of the diffuser when I opened it, I guess you could say that I took a sample.

Q. Okay. So did you send the insulation

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to a lab for culturing or anything like that?

A. I did not. The lawyer for whom I was working was with me, along with the plant engineer and the hospital's lawyer, and we all saw this happen. And I said to the engineer -- I mean, the architect -- the attorney for whom I was working, "Look, this is not a scientific sample, but I suggest you put that in your pocket," which he did. And I don't know what he did with it after that.

Q. So you said other than temperature and humidity and pressure, you didn't take any other measurements of the airflow?

A. That's correct.

Q. And other than taking that piece of insulation, did you do any swabbing or culturing or air sampling of any kind?

A. No, I did not.

MS. ZIMMERMAN: Object to form.
BY MR. GOSS:

Q. Did you -- I think you mentioned you wrote a report in that case?

A. Yes.

Q. What opinions did you offer in that

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report? If you can recall.

A. Well, I had seen -- this is called microbial growth algae, whatever it was, inside the air handler, in the drain pan of the air handler. So I -- I simply noted that there was green slime there. I didn't attempt to define what it was. And I was concerned that the ductwork outside the OR was lined with fiberglass and had been built in the late '70s, and that there was a humidifier right outside that particular OR, so it was blowing humidity into the duct, which was lined with fiberglass.

And I'm 92 percent convinced that what fell out of that diffuser when I opened it was a piece of the black lining from the fiberglass lining of the ductwork.

Q. And was that lining on the inside or the outside of the ductwork?

A. Inside.

Q. Did you offer an opinion that the source of the plaintiff's infection was the HVAC system in the hospital?

A. I simply noted that the combination of that nice fibrous base and the humidifier

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blowing humidity right there was likely to be a nice place that mold and microorganisms would grow.

Q. So did you offer any opinions on what caused the patient's infection?

A. No.

Q. Did you offer any opinions regarding whether the conditions in that HVAC system increased the patient's risk of infection?

A. Well, I pointed out what I viewed as shortcomings. The lining in the ductwork of someplace right around the same time, the various codes said, don't put lining in the ductwork. That was right in the mid '70s. So I simply pointed out that, you know, while it might have been grandfathered in, shortly after it was built, everybody in the industry decided this was a bad idea. The humidifier right outside the room was also a bad idea.

Q. Because it created a moist environment; is that right?

A. Yes.

Q. Did you, in your report, connect the shortcomings of the HVAC system to an increased

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risk for the patient to develop an infection?

MS. ZIMMERMAN: Object to form.

THE WITNESS: You know, I'd have to go back and look at the thing. It's been, what, eight years.

BY MR. GOSS:

Q. Do you remember the name of the lawyer who retained you?

A. It was in Wichita. Can't believe I've forgotten it.

Q. Was the case in Kansas?

A. Yes. I've probably got it here in my phone if you want me to look at it. It started with a W.

Q. And I take it the defendant was a hospital?

A. That's correct.

Q. Were there any other defendants besides the hospital?

A. I don't know.

Q. Did you offer any opinions in that case that any of the HVAC equipment was defectively designed or manufactured by the manufacturer of that equipment?

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 2 A. No.
 3 MS. ZIMMERMAN: Object to form.
 4 THE WITNESS: No.
 5 BY MR. GOSS:
 6 Q. So your opinions in that case related
 7 to the installation of the equipment and not
 8 the manufacture of the individual components;
 9 is that right?
 10 A. Correct.
 11 Q. Do you still have a copy of your
 12 report in that case?
 13 A. Yes. I'm sure I could find it.
 14 Q. And I think you mentioned in this
 15 resume that the result of the case was a
 16 favorable out-of-court settlement for the
 17 plaintiff. Do you remember the amount or did
 18 you ever know the amount of the settlement?
 19 A. I was never told.
 20 (Thereupon, Exhibit 11 was marked for
 21 identification.)
 22 BY MR. GOSS:
 23 Q. Exhibit Number 11 is a -- a listing
 24 on Expert Pages; is that right?
 25 A. Yes.

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 2 A. I'd really have to go back to look at
 3 the exact chronology, but someplace along the
 4 way, my company, the company for whom I was
 5 working, I talked with them about doing expert
 6 witness. They did not want me to do it as an
 7 employee.
 8 Q. Was that Dewberry?
 9 A. That's Dewberry.
 10 Q. When did you first start working with
 11 Dewberry?
 12 A. Dewberry bought my company in 2008.
 13 Q. And what's Dewberry?
 14 A. Dewberry is a large engineering firm
 15 based in Fairfax.
 16 Q. Fairfax, Virginia?
 17 A. Yes.
 18 Q. And did they come to you or did you
 19 want to sell? How did the transaction come
 20 about?
 21 A. They came to me.
 22 Q. So they bought your company and you
 23 stayed on as an employee; is that right?
 24 A. Correct.
 25 Q. Did they tell you why they didn't

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1 KOENIGSHOFER
 2 Q. And is this your listing?
 3 A. Looks like it. Yes.
 4 Q. When did you first start -- when did
 5 you first put a listing on Expert Pages?
 6 A. Oh, I don't know. Call it spring of
 7 '16.
 8 Q. Do you think it was before or after
 9 you got a call from Mr. Gordon?
 10 A. I think it was after.
 11 Q. Why did you decide to put a listing
 12 on Expert Pages?
 13 A. So I could get more expert
 14 consulting.
 15 Q. So before this listing, you really
 16 only had experience as an expert witness in one
 17 other case; right?
 18 A. Yes.
 19 Q. But you were interested in doing
 20 more; is that right?
 21 A. Yes.
 22 Q. Did that coincide with a change in
 23 your workload or career? In other words, did
 24 you have more time to do expert consulting or
 25 what was the reason for the listings?

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 2 want you to do expert consulting?
 3 A. Well, they thought that it might have
 4 some liability for them, but probably more
 5 importantly, it was, you know, client
 6 relations.
 7 Q. What was their concern about client
 8 relations for expert testimony?
 9 MS. ZIMMERMAN: Object to form.
 10 BY MR. GOSS:
 11 Q. Did they tell you?
 12 A. No. I would say it's obvious. But
 13 no.
 14 Q. Well, did they ever say you couldn't
 15 testify for their clients?
 16 A. Well, we agreed. They said, you
 17 know, don't get -- don't get involved with
 18 suing us or any of our clients. And I said,
 19 "Sure, no problem."
 20 Q. So when you put out this listing on
 21 Expert Pages, obviously, your previous
 22 experience was testifying on the plaintiff's
 23 side of the case; correct?
 24 A. Yes.
 25 Q. Was it your intent that you would

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only testify for plaintiffs or were you open to testifying for defendants?

A. B.

Q. So both?

A. Yes.

Q. Since you put this listing up, have you gotten any calls, any potential referrals?

A. I got a call from a guy whose air conditioner burned up in his house. And a call from a lady who had, I don't know, mold in her crawl space or something. And I turned them both down.

Q. Have you been approached ever by any manufacturers of HVAC equipment to serve as an expert witness in their cases?

A. No.

Q. Have you ever had any conversations with any manufacturers of HVAC equipment about litigation that they were involved in? That you can recall.

A. No.

Q. So are you currently employed by Dewberry?

A. I work for them about 20 hours a

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week.

Q. Are you still an employee or do you have an independent contract relationship with them? How would you characterize it?

A. It's complicated. Basically, I can't really answer that question, not because I won't, but I can't. I do get -- I can work however many hours I want and I get paid hourly. And I get a paycheck from them, which -- from which they do withholding. But I don't get any benefits.

Q. Do your expert fees for your work on this case go to Dewberry?

A. No.

Q. And did you need to ask Dewberry for permission to participate as an expert in this case?

A. No. I mean, you know, again, the agreement is I'm not going to do anything that, basically that Dewberry has anything to do with.

Q. Have you talked to anyone at Dewberry about the fact that you were retained as an expert witness in this case?

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A. Yes.

Q. Who have you spoken to about that?

A. Shepherd Hockaday.

Q. And who is that?

A. He's sort of my boss.

Q. Did you talk to Mr. Hockaday about the deposition today?

A. Probably not. Probably not.

Q. What was the nature of your conversation with Mr. Hockaday about your participation as an expert in this case?

A. It was just casual conversation. What are you up to these days? What are you doing with all your time besides playing golf?

Q. Did you talk to Mr. Hockaday about your opinions in this case?

A. No.

Q. We covered Mr. Hockaday.

Have you talked to anyone outside from counsel at this table in preparation for your deposition today?

A. No.

Q. Can you tell me what you did to prepare for the deposition today?

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A. Well, as you know, I didn't get a whole lot of warning about it. So I carefully reviewed my report. Then I reviewed the reports that I cited in my report and gathered a few others, but I didn't really get around to reading much of anything else.

Q. So you reviewed your report. Did you have occasion to revisit any of your opinions?

A. No. I mean, I marked it up a little bit for typos and things I found in it.

Q. Is there anything in your report that you felt you needed to amend or modify?

A. Well, only one thing, but at some point toward the end of my report, I said that the Bair Hugger might put out 50 to 100 CFM. Honestly, I don't know where I got the 100, but...

Q. Okay.

A. It should have read "about 50."

Q. So this is on page 23 of the report, right at the top of the page?

A. That's correct. That's correct.

Q. You say, "50 to 100 CFM are blown from the blanket into or near the sterile

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1 KOENIGSHOFER
 2 field." And you're saying that that should
 3 read "about 50 CFM"; is that right?
 4 A. Yes. Yes.
 5 Q. And what is the 50 based on?
 6 A. Well, one of the -- I'm not a Bair
 7 Hugger expert. One of them puts out about 48
 8 CFM. I can't remember which one. I couldn't
 9 cite the model for you.
 10 Q. So if I told you that the
 11 specifications for the 750/775 say it will put
 12 out up to 48 CFMs, does that sound right to
 13 you?
 14 A. Yes.
 15 Q. Are you familiar with another model
 16 of Bair Hugger that's at issue in this case?
 17 A. You know, only in a very general way.
 18 I realize there's a 505 and 550 and a 700 or
 19 whatever. I did not make an effort to memorize
 20 the nuances of the different models.
 21 Q. Did you have an understanding that
 22 the airflow rate of other models might be
 23 different from the 750/775?
 24 A. Yes, I know that.
 25 Q. Do you -- do you know roughly what

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1 KOENIGSHOFER
 2 that airflow is?
 3 A. I think some of them are in the range
 4 of 35, 30 CFM, something like that.
 5 Q. So if the 505 were about 30 CFM,
 6 would you have any reason to disagree with
 7 that?
 8 A. I would have to look it up.
 9 Honestly, I don't remember which is which.
 10 Q. All right. Anything else in your
 11 report after reviewing it that you felt you
 12 needed to amend or modify?
 13 A. No. Again, other than just typos.
 14 Q. Okay. In preparation for your
 15 deposition today, did you review any documents
 16 from 3M or Arizant?
 17 A. So you're saying in the last two or
 18 three weeks since I've known I was going to be
 19 deposed?
 20 Q. Yeah. Let's start with that.
 21 A. No.
 22 Q. Before that, have you reviewed
 23 documents from 3M or Arizant?
 24 A. Yes.
 25 Q. Were you provided a copy of the

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1 KOENIGSHOFER
 2 protective order in this case that designates
 3 certain documents as confidential?
 4 A. Yes.
 5 Q. And have you signed an acknowledgment
 6 to be bound by it?
 7 A. Yes.
 8 MS. ZIMMERMAN: It's in the binder.
 9 MR. GOSS: Okay. Thanks.
 10 BY MR. GOSS:
 11 Q. In preparing for your deposition
 12 today, have you reviewed any reports from other
 13 plaintiff's experts?
 14 A. Yes.
 15 Q. Which ones did you review?
 16 A. Keen, K-E-E-N, Koehn, K-O-E-H-N, I
 17 believe.
 18 Q. I'm going start just by asking about
 19 plaintiff's experts. Experts on the
 20 plaintiff's side.
 21 A. Oh, Elghobashi.
 22 Q. Okay.
 23 A. I think that's it.
 24 Q. Did you review a report by Yadin
 25 David?

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 2 A. No.
 3 Q. Did I get that right?
 4 MR. ASSAAD: Close enough.
 5 MR. GOSS: Is it David?
 6 MR. ASSAAD: David, yes.
 7 MR. GOSS: It is David. Okay.
 8 THE WITNESS: Never heard the name.
 9 BY MR. GOSS:
 10 Q. Did you review a report by Michael
 11 Buck?
 12 A. No.
 13 Q. Did you review a report by William
 14 Jarvis?
 15 A. No.
 16 Q. So you started out mentioning that
 17 you reviewed reports by Keen and Kuehn, which
 18 he actually pronounces it Keen too, so they're
 19 both Keens. And I'll just tell you for a
 20 shorthand, the way I keep it straight is
 21 there's an American Kuehn and a Canadian Keen.
 22 A. Yes.
 23 Q. All right. Do you know either of
 24 those gentlemen?
 25 A. I know Michael Keen, the Canadian

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Keen.

Q. How do you know him?

A. From ASHRAE.

Q. Have you worked with him on any committees?

A. Yes.

Q. Which one?

A. The technical committee 9.6, which is called Healthcare HVAC. And I believe he's -- I'm pretty sure he's on 170.

Q. That's the committee for Standard 170?

A. Yes, sir.

Q. Are you on that committee?

A. I'm a nonvoting member, which is going to change July 1st.

Q. So on July 1st you will become a voting member of the committee for Standard 170?

A. I believe that's true.

Q. What has to happen in order for you to become a voting member of this committee?

A. Honestly, I don't know. I guess the rest of the committee's got to vote on me. I'm

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not sure.

Q. Somebody will give you a call?

A. Well, they've asked for resumes.

I've sent all that. And I got a confirmation from ASHRAE just a few days ago saying, okay, everything looks good and we'll pass all this on to the committee. And I've been attending the meetings for 15 years, so I expect that I will be approved.

Q. Have you ever worked with Michael Keen on any projects or anything outside of your service on Technical Committee 9.6?

A. No.

Q. Do you consider Michael Keen to be an upstanding member of ASHRAE?

A. I do.

Q. He's an engineer as well; correct?

A. Yes.

Q. Have you ever had occasion to criticize any of his work?

A. No.

Q. The other Keen, American Kuehn, that's Thomas K-U-E-H-N; correct?

A. That sounds right.

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Q. You don't know him?

A. Correct.

Q. Have you encountered him in connection with ASHRAE ever?

A. No. I had never heard of him.

Q. All right. So you reviewed his report and Michael Keen's report. Did you review any other defense expert reports in preparation for your deposition?

A. Ho.

Q. That's Dr. Jim Ho?

A. That sounds right.

Q. Do you know him?

A. No. Can I ask for help here?

Q. Sure.

A. That's one other I can't remember.

Q. Yeah. You got a --

A. I have to remember?

Q. Yeah. You can't --

A. Well, then okay.

Q. If there is another one that you reviewed, feel free to go through your materials.

A. The guy that did the Schlieren

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stuff -- Settles. That's it.

Q. Do you know -- do you know Gary Settles?

A. I do not.

Q. Are you familiar with the Schlieren imaging technique discussed in his report?

A. Very vaguely.

Q. Have you ever been involved in any research projects that use the Schlieren technique?

A. No.

Q. Okay. So you've got four defense expert reports that you reviewed. Keen, American Kuehn, Canadian Keen, Ho and Settles. Any others that you can remember?

A. No.

Q. All right. And you would have reviewed those within the last two weeks; is that right?

A. Yes.

Q. Other documents that you reviewed in preparation for this deposition that you can recall?

A. Well, I know I read Van Duren's

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deposition.

Q. Van Duren?

A. Van Duren.

Q. Was that in the last two or three weeks?

A. No. I guess I'd have to look at the book again. I read some other expert's stuff and I can't remember who. Not expert, deposition.

Q. Some other depositions? And I'm really just asking for what you can remember, what stands out in your mind as significant that you reviewed to prepare for today. We've covered the Elghobashi expert report from the plaintiffs, the four expert reports from the defense. Any other documents that you spent particular -- gave particular focus or attention to prepare for today?

MS. ZIMMERMAN: In addition to his report.

BY MR. GOSS:

Q. In addition to your report. That's right.

A. Well, I mean, I looked at an exploded

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view of a Bair Hugger on one of their maintenance manuals that's available online.

Q. Okay. And why did you do that?

A. See how it's built.

Q. Was that something you did in the last couple weeks to prepare for today?

A. No.

Q. Was there anything about that exploded view of the Bair Hugger that contributed to your opinions in this case?

A. Yes. Well, I mean, I looked carefully at how the filtration works.

Q. So from the exploded view of the Bair Hugger, you could tell how the filtration works in the unit?

A. Well, how it's installed, yes.

Q. Okay. Obviously, you met with counsel to prepare for the deposition today; correct?

A. Yes.

Q. And I'm not going to ask you about specific documents you reviewed with them. I just want to know how many meetings did you have with them to prepare for today?

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A. One.

Q. Was that --

A. Yesterday.

Q. So the meeting you had in Minneapolis, was that more to do with your report than deposition preparation?

A. That's correct. Yes.

Q. Okay. I want to talk a little more about your experience. Do you have any medical training?

A. No.

Q. You've already indicated that you don't have expertise in microbiology?

A. Correct.

Q. Do you have expertise in infectious diseases?

A. No.

Q. Do you have any expertise in aseptic technique?

A. No.

Q. Expertise in infection control practices other than as they relate to HVAC systems?

A. No.

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Q. Do you have expertise in heat transfer?

A. I understand heat transfer. I'm not a professor of heat transfer.

Q. Are you an expert in air filtration?

A. I understand filtration quite well. Relative to other people at ASHRAE who truly are experts, I do not know as much as they do.

Q. Have you ever conducted any testing to determine the efficiency of an air filter?

A. Well, if you go all the way back to my air pollution days, that was sort of what I was doing.

Q. Okay. Have you ever conducted any testing to determine the efficiency of an air filter used in a hospital?

A. No.

Q. Do you consider yourself an expert in ASHRAE Standard 52.2?

A. No.

Q. Do you have any expertise in biomedical engineering?

A. No.

Q. Before you were retained in this

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1 KOENIGSHOFER
 2 case, had you ever heard of a Bair Hugger?
 3 A. Yes.
 4 Q. How did you -- what do you recall
 5 about Bair Huggers before you got into the
 6 litigation?
 7 A. I'm just very interested in
 8 everything hospital. So when I would talk to
 9 friends of mine or owners who work at
 10 hospitals, we'd talk about, you know, what
 11 exactly do they do in there? How does it all
 12 work? So someplace along the way, someone
 13 mentioned a Bair Hugger.
 14 Q. Did you ever have any conversations
 15 with anyone before you got involved in this
 16 case about any concerns they had about the Bair
 17 Hugger and whether it was affecting the OR
 18 environment at their hospital?
 19 A. No. It was actually in the context
 20 of are we going to put a blanket warmer into
 21 this OR? "Yes" or "no"? No, because we use
 22 Bair Huggers. What's a Bair Hugger?
 23 Q. Okay. So you mentioned a blanket
 24 warmer. What would that be? As distinguished
 25 from the Bair Hugger, what's a blanket warmer?

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1 KOENIGSHOFER
 2 with respect to patient-warming devices other
 3 than the Bair Hugger, you did some research on
 4 the Mistral device?
 5 A. Yes.
 6 Q. What did you look into with the
 7 Mistral?
 8 A. I simply was Googling around and came
 9 upon them as a, I guess, competitor. So I went
 10 to their website and looked at what they sell,
 11 what they do, their points of view.
 12 Q. What did you learn from your research
 13 into Mistral? What stood out in your mind as
 14 relevant to your opinions in this case?
 15 MS. ZIMMERMAN: Object to form.
 16 THE WITNESS: I would need to look at
 17 -- you know, it's been -- this was back
 18 when I first started on this case, a year
 19 or more ago. It seems to me I recall the
 20 fact that they used a true HEPA filter in
 21 their device.
 22 BY MR. GOSS:
 23 Q. Anything about -- anything else about
 24 the Mistral that stood out to you as
 25 noteworthy?

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 2 A. It's a large device that looks like a
 3 refrigerator. Literally heats whatever's in
 4 there, but they put blankets in there, I guess.
 5 Q. Oh, okay. So this --
 6 A. Wool blankets. I don't know what
 7 they are. Cotton -- I don't know what they're
 8 made of -- blankets.
 9 Q. I gotcha. So this -- this would be
 10 some sort of a heater or heater storage for
 11 normal cotton or wool blankets; is that right?
 12 A. That's correct.
 13 Q. It's not like an electric blanket
 14 that you would put on an OR table?
 15 A. That's correct. I mean, it's
 16 electric. Uses electricity. You plug it in
 17 the wall. You use electricity to make heat and
 18 it heats however many blankets you've got
 19 stacked in this cabinet.
 20 Q. But the blankets themselves aren't
 21 something that you --
 22 A. Regular old blankets.
 23 Q. It's not something you plug in?
 24 A. No.
 25 Q. Okay. I think you mentioned earlier

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1 KOENIGSHOFER
 2 A. No. I spent a lot of time on their
 3 website reading about nosocomial --
 4 normothermia.
 5 Q. Okay. On the Mistral website?
 6 A. Yeah. They just had an article about
 7 it.
 8 Q. Other than your reading of the
 9 Mistral article about normothermia, did you do
 10 any other research into normothermia?
 11 A. No. I can't think that I read
 12 anything else about it.
 13 Q. Do you have an understanding of the
 14 technical definition of normothermia versus
 15 hypothermia?
 16 A. No.
 17 Q. Have you reviewed any literature that
 18 talked about the benefits of normothermia to
 19 the patient?
 20 A. Yes. Some of these articles that are
 21 truly about Bair Huggers or whatever, they kind
 22 of start out with "why do Bair Huggers exist."
 23 And they'll have a paragraph about
 24 normothermia.
 25 Q. What's your understanding of the

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1 KOENIGSHOFER
 2 benefits to the patient of normothermia?
 3 A. Well --
 4 MS. ZIMMERMAN: Object to form. You
 5 can go ahead.
 6 THE WITNESS: I understand that
 7 anesthesia, patients get cold, and for the
 8 most part, anesthesiologists don't like
 9 for the patients to get cold, and so it's
 10 beneficial to the patient to be kept warm.
 11 BY MR. GOSS:
 12 Q. To your understanding, are there any
 13 benefits to the patient of normothermia, beyond
 14 comfort?
 15 A. I believe that I have read that, you
 16 know, the outcomes are improved by not letting
 17 the body get too cold.
 18 Q. But at any rate, you're not an expert
 19 in temperature regulation of the human body?
 20 A. I am not a biological expert.
 21 Q. Have you ever participated in an
 22 investigation of an infectious outbreak at a
 23 hospital?
 24 A. Well, that expert witness case that I
 25 was on. I guess you could say it was. It

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1 KOENIGSHOFER
 2 wasn't really an outbreak.
 3 Q. Okay. It was one patient; right?
 4 A. Yes.
 5 Q. Have you ever worked with a hospital
 6 that was investigating an outbreak or cluster
 7 of infections?
 8 A. No.
 9 Q. Do you have any expertise in the
 10 cleaning chemicals that are used to clean
 11 operating rooms?
 12 A. No.
 13 Q. Do you have any expertise in hospital
 14 sanitation and hygiene practices other than
 15 HVAC?
 16 A. About this much (indicating).
 17 Q. What can you tell me that you know
 18 about that?
 19 A. Well, I understand that there's
 20 something called a terminal clean, which is, in
 21 my limited understanding, is a super-deduper
 22 cleaning, which is different than -- I didn't
 23 even know the name of a nonterminal clean.
 24 That's kind of everything I know about it.
 25 Q. You've designed HVAC systems for

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1 KOENIGSHOFER
 2 operating rooms; correct?
 3 A. Yes.
 4 Q. About how many would you say you've
 5 done?
 6 A. Well, from scratch, maybe 20.
 7 Q. Were any of those ORs dedicated to
 8 orthopedic surgery?
 9 A. You know, my mind goes fuzzy between
 10 things that I designed and places that I worked
 11 to try to improve conditions.
 12 Q. Okay. Well, let's include both in
 13 your answer.
 14 A. Okay. Then yes.
 15 Q. How many orthopedic ORs have you
 16 either designed or worked to improve in some
 17 way?
 18 A. Let's just say 15.
 19 Q. Is there a difference in your
 20 approach to the HVAC system for a general
 21 surgery OR versus an orthopedic OR?
 22 A. No.
 23 Q. So your approach is the same. Is
 24 there anything different in the execution of
 25 the design of an orthopedic OR versus a general

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 2 surgery OR?
 3 A. Some clients insist on using HEPA
 4 filtration, although it's not required. One of
 5 the studies I did was on, the surgeons wanted
 6 to put curtains around the diffuser array. And
 7 they asked me to give them a little study of
 8 pros and cons of that. It was an orthopedic
 9 surgery -- orthopedic OR.
 10 Q. The curtain, was it an air curtain or
 11 a fabric curtain? What kind of curtain was it?
 12 A. Plexiglass.
 13 Q. Okay. So it was a Plexiglass curtain
 14 around --
 15 A. More of a barrier.
 16 Q. A barrier around the diffusers and
 17 the ceiling of the OR?
 18 A. Yes.
 19 Q. And was this an orthopedic group that
 20 wanted to do this?
 21 A. It was a hospital that -- but it was
 22 an orthopedic surgery unit. It wasn't a
 23 private orthopedic group was the distinction
 24 I'm making there.
 25 Q. So it was for a hospital, but the

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room was going to be for their orthopedic unit?

A. Yeah. Well, it already was, but they wanted to add the Plexiglass barrier.

Q. Was there a particular manufacturer of the Plexiglass barrier or was it part of an integrated system with diffusers?

A. Yes. And I don't remember the name of the manufacturer.

Q. What was your advice to the hospital of the use of this Plexiglass barrier?

A. I recommended that it was not cost effective.

Q. What was the rationale behind the Plexiglass barrier? What it was supposed to do?

A. Well, it was supposed to improve the laminar flow of the air as it comes from the diffuser. Keep it as straight as you can as long as you can. So they would stick down, I don't know, maybe 18, 24 inches, something like that.

Q. So let me ask you some questions about that statement. When we say "laminar flow," what are we really talking about?

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MS. ZIMMERMAN: Object to form.

BY MR. GOSS:

Q. In the context of a hospital and air supply from the ceiling.

A. Well, in the context of a hospital, we put in diffusers, which literally in the industry are called "laminar flow diffusers."

It is a type of a diffuser, which consists of big metal covers with a bunch of small holes in them, and the air gently flows down in kind of a rainfall pattern.

Q. So what makes it laminar?

MS. ZIMMERMAN: Object to form.

THE WITNESS: Well, it is released in a strictly vertical manner and at a speed that, as I say, you -- 35 feet a minute makes basically a maximum velocity at the diffuser. And so you hope that it just stays together as a laminar flow.

BY MR. GOSS:

Q. Okay. Do the -- do the holes in the diffuser outflow, does that have something to do with what makes it laminar?

MS. ZIMMERMAN: Object to form.

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Foundation.

THE WITNESS: Well, yeah. You've got to give it a little kick in the butt to get the air moving.

BY MR. GOSS:

Q. Would it be fair to say that you're not an expert in laminar flow?

A. Yeah. Yes.

Q. I think there was a comment in your report and a footnote on page 13. So there's a sentence in the first paragraph. It says, "As shown in the following figure, clean air is directed into the room through so-called laminar diffusers." And then there's a footnote; right?

A. Yes.

Q. The footnote says, "This intentional airflow is frequently called laminar, though the airflow is not truly laminar from a physics perspective." What did you mean by your statement in the footnote?

A. Well, to be honest, I'm just repeating what true laminar flow experts have said to me, guys who are, you know, Ph.D Penn

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State gurus in this kind of stuff. And they say it's not really laminar flow. And I say, okay, okay, okay. But we engineers call it that.

Q. All right. So do you know the names of any of the -- can you remember the names of any of the laminar flow gurus that you've spoken to about this?

A. No, not really. This is a long time ago. There was a guy from Penn State, but I can't remember.

Q. It wasn't Gary Settles?

A. No, no, no. It was not Gary Settles. He probably would -- he could probably answer this question.

Q. Let's see. All right. So we started on this tangent about laminar flow when we were talking about this system that you were asked to advise the hospital on that had these Plexiglass barriers; right?

A. Uh-huh.

Q. Okay. And your advice to the hospital was that the system was not cost effective; is that right?

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A. Yes.

Q. So did you undertake an analysis of the potential benefit versus the cost of the system?

A. Well, I was aware of the cost and it was quite expensive. And it probably came more from discussions with my cohorts and asking them what their experience has been.

And I visited a plant in Texas that makes these things and they had smoke coming out of it. And we observed it.

Q. Do you remember what town -- what town in Texas?

A. It was the Titus factory.

Q. Okay. Was Titus the manufacturer?

A. Yes. Titus is a manufacturer of HVAC equipment. I visited that facility along with some other guys on the 9.6 committee. And we came away from it, saying, I don't know, didn't really -- didn't really see any big improvements.

Q. So is it fair to say that after visiting the plant, seeing the system, talking to your colleagues, you didn't see any promise

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for the system to reduce the risk of surgical site infections with this equipment?

MS. ZIMMERMAN: Object to the form of the question. Misstates the testimony.

BY MR. GOSS:

Q. Is that fair?

A. Yes.

MR. GOSS: Doing okay?

THE WITNESS: I'd like to hit the restroom, but otherwise, I'm doing okay.

MR. GOSS: Let's take a break.

THE VIDEOGRAPHER: Off record, 11:26 a.m.

(Thereupon, a brief recess was taken.)

THE VIDEOGRAPHER: Start of Tape 3. Back on record, 11:37 a.m.

MS. ZIMMERMAN: Counsel, if we could just to clarify the record before you get going on.

We're offering Mr. Koenigshofer as an expert in unidirectional flow in an operating room, not on the calculations of laminar flow and all of that, but we are offering him as an expert in laminar flow

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in an OR. So to the extent that may help clarify things moving forward. I want to make sure we have a record of that.

BY MR. GOSS:

Q. All right. Well, let me ask you again. You said you're not an expert in laminar flow; correct?

A. Your definition of expert and my definition of expert may not be exactly the same. In my definition, I'm not. There's guys that have got Ph.Ds that have been doing laminar flow calculations their whole lives.

Q. Understood. And --

A. Those guys are experts. I'm not that level.

Q. And I'm just asking for your own assessment of your own expertise. So are you -- do you consider yourself an expert in unidirectional flow in an operating room?

MS. ZIMMERMAN: Just so that we're clear, is that the calculation of the flow rate or the actual concept of it and when it's used?

MR. GOSS: I mean, I think that's a

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fair distinction.

BY MR. GOSS:

Q. So let me put it this way. You don't hold yourself out as an expert in the physics of airflow from an OR diffuser; correct?

MS. ZIMMERMAN: Counsel, I'm sorry, I object to form. Again, I'm not sure that that clarified, at least even for me, what you're asking. So...

BY MR. GOSS:

Q. So what is your expertise in -- how you would describe your expertise in OR airflow?

A. I design the OR airflow systems, utilizing the guidelines, using the published guidelines.

Q. So if someone were to come to you and ask what's laminar versus turbulent versus some other type of airflow in a hospital, would you be able to answer that question?

MS. ZIMMERMAN: Object to form. Again, are we talking about mathematical calculations of each or...

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 2 BY MR. GOSS:
 3 Q. I just want to know his answer to the
 4 question. Would you be able to answer that
 5 question?
 6 A. Yes.
 7 Q. And how would you answer that
 8 question?
 9 A. I would probably get a piece of paper
 10 and indicate air moving unidirectionally as
 11 opposed to turbulently.
 12 Q. Okay. And what about systems that
 13 deliver laminar flow versus turbulent flow? Do
 14 you have any expertise in the difference
 15 between those types of systems?
 16 A. Well, yes. I mean, I could design
 17 this room, and this diffuser right here works
 18 on the basis of turbulence. That's what it
 19 depends upon.
 20 Q. But in terms of operating room air
 21 supply, do you have expertise in the difference
 22 between a turbulent diffuser versus a laminar
 23 one?
 24 MS. ZIMMERMAN: Object to form.
 25 THE WITNESS: Ask me the question

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 2 again.
 3 BY MR. GOSS:
 4 Q. Sure. How would you describe or can
 5 you answer the question, what the difference is
 6 between a turbulent supply system in an
 7 operating room and a laminar supply system?
 8 A. Yes. And that's -- that was my -- my
 9 hand drawings.
 10 MS. ZIMMERMAN: And if we could just
 11 clarify for the record and the court
 12 reporter that the witness is gesturing
 13 with his hands.
 14 THE WITNESS: Vertical airflow fairly
 15 tight.
 16 BY MR. GOSS:
 17 Q. Okay. You've never calculated a
 18 Reynolds number; is that true?
 19 A. I have in college.
 20 Q. Is calculating a Reynolds number part
 21 of what you do in your engineering practice
 22 when working with hospitals?
 23 A. No.
 24 Q. Have you tried to calculate a
 25 Reynolds number for any of your work in this

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 2 case?
 3 A. No.
 4 Q. What are the issues that you've been
 5 asked to address in this case?
 6 A. I guess just the overall use of the
 7 Bair Hugger in an operating room.
 8 Q. Have you done any experiments to
 9 address that question?
 10 A. No.
 11 Q. Have you taken any measurements of
 12 air temperature or velocity coming out of a
 13 Bair Hugger blanket?
 14 A. No.
 15 Q. Have you done any experiments to
 16 determine the efficiency of Bair Hugger
 17 filters?
 18 A. No.
 19 Q. Have you done any testing
 20 measurements or experimentation of any kind on
 21 a Bair Hugger unit?
 22 A. No.
 23 Q. Have you seen a Bair Hugger unit in
 24 person?
 25 A. Yes.

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 2 Q. When was that?
 3 A. In March.
 4 Q. Was that during the meeting with
 5 counsel?
 6 A. Yes.
 7 Q. Outside of that meeting, have you
 8 seen a Bair Hugger unit in person?
 9 A. I'm sure I've seen them when I've
 10 been in operating rooms.
 11 Q. But fair to say you didn't examine
 12 them closely in that setting?
 13 A. Correct.
 14 Q. When you saw the Bair Hugger unit in
 15 March, how was it set up?
 16 A. Just sitting on the floor.
 17 Q. Was it connected to a blanket?
 18 A. No.
 19 Q. Did you do anything with the Bair
 20 Hugger unit when you saw it?
 21 A. I took the cover off so I could see
 22 inside.
 23 Q. Did you turn it on?
 24 A. I don't think so.
 25 Q. And you said it was not connected to

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a perforated blanket; is that right?

A. That's correct.

Q. Have you ever felt the flow of air from a Bair Hugger blanket?

A. No.

Q. Have you ever felt the flow of air from a Bair Hugger hose that's not connected to a blanket?

A. No.

Q. So when you say you took the cover off of the Bair Hugger, what was your goal in doing that?

A. See the insides.

Q. Was there anything that stuck out in your mind as significant from your looking on the inside of a Bair Hugger unit?

MS. ZIMMERMAN: Object to form.
BY MR. GOSS:

Q. What did you take away from that, is what I'm asking.

A. It looked just like my wife's hair dryer that I tried to fix recently.

Q. So it had a heating coil in it; correct?

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A. Uh-huh.

Q. And a fan?

A. And a fan.

Q. Does your wife's hair dryer have a filter?

A. No.

Q. So that would be one difference?

A. Sure.

Q. So the Bair Hugger that you examined was -- that wasn't in an OR at the time; right?

A. Correct.

Q. And if you didn't turn it on, is it fair to say that you didn't evaluate whether the air from the Bair Hugger was doing anything to the air in the room?

A. That's correct.

Q. Do you remember what model of Bair Hugger it was?

A. I think it was early in the 500 series, I believe.

Q. Do you remember if it was white or kind of blue/purple?

A. I think it was white.

Q. Did you take the filter out of that

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Bair Hugger?

A. I don't remember.

Q. Do you remember what the filter looked like, like what shape it was?

A. Yeah. I think it was one of the flat rectangular ones.

Q. Did you take the filter out and examine it?

A. Honestly, I don't remember whether I did or did not.

Q. You mentioned this filter was a flat rectangular one. Are you familiar with other shapes or sizes of Bair Hugger filters?

A. Oh, again, I've seen on the exploded views that they have cylindrical ones.

Q. Other than the shape of the filter being different between the cylindrical and the rectangular, do you have any understanding as to whether the filter media in those two filters is different as of today?

A. Is different between a rectangular versus the cylindrical?

Q. Yes, sir.

A. I don't know.

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Q. Do you have any understanding as to whether the filter media in the cylindrical and the rectangular filters was different at some time in the past, that they differed from each other?

A. You know, it seems like in the Van Duren or something, there was conversations about this, but sitting here right this minute, I don't remember. We could look at Van Duren. I believe it was Van Duren that said something about that I think there were some changes along the way.

Q. Do you intend to testify at trial about changes in the filter media in the Bair Hugger units?

A. I don't know.

Q. Do you -- do you have any opinions today about changes in the filter media in the Bair Hugger filters?

A. No.

Q. So you've seen a Bair Hugger unit. Have you ever seen a Mistral unit in person?

A. No.

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Q. Have you ever seen any other patient-warming devices in person?

A. No.

Q. Are you familiar with a device called the HotDog?

A. Only from the materials that I read in relation to this case.

Q. What's your understanding of what the HotDog is and how it works, if you have one?

A. It appears to me it's an electric blanket.

Q. Have you done any research for this case on the HotDog warming system?

A. I've looked at their website. I would not call it research.

Q. For your work on this case, have you done any research on standards or regulations that apply to patient warming devices?

MS. ZIMMERMAN: Object to form.

THE WITNESS: Can you ask me the question again.

BY MR. GOSS:

Q. Sure. Are you aware of any standards or regulations that apply to patient-warming

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devices?

MS. ZIMMERMAN: Object to form.

THE WITNESS: I am not aware of any.

BY MR. GOSS:

Q. Are you aware of any requirements or any regulations or standards that require the use of filtration in hospital equipment, other than the HVAC system?

MS. ZIMMERMAN: Object to the form of the question.

THE WITNESS: I'm not aware of any.

BY MR. GOSS:

Q. So for -- strike that.

Are you familiar with the types of infections that the -- no, back up.

Are you familiar with the types of surgeries that the plaintiffs in this litigation have undergone?

A. Well, in a general way, yes. My father-in-law just had a knee replacement. And I've looked at the -- a YouTube of a hip replacement.

Q. And when you say the YouTube hip replacement, are you referring to a particular

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video?

A. I wouldn't know. I mean, it was one of those days where you're just fishing all around the internet and you find something. It was not one put out by -- it was more of a training for medical people.

Q. Did it relate to the Bair Hugger at all?

A. No.

Q. All right. So do you have an understanding that the majority of the plaintiffs in this litigation have undergone either a hip replacement or a knee replacement?

A. Yes, I know that.

Q. And have you requested any information about the types of infections that these plaintiffs have developed as a result of those procedures?

A. No.

Q. In association with those procedures?

A. No.

Q. Do you -- for your work on this case, did you do any research into the rate of infection for hip and knee replacements in this

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country?

A. Somewhat, yes. But then you're going to ask me for the numbers.

Q. Yes, sir. What's your understanding of the current infection rate for hip procedures in this country?

A. I would really have to look at my booklet here.

MS. ZIMMERMAN: You can look at your notes.

THE WITNESS: If he wants me to do that, I'll do that.

MR. ASSAAD: Do it if you want to.

BY MR. GOSS:

Q. Do you have a general understanding of the infection rate for hip and knee replacements? Do you remember a figure?

A. I think it's generally in the range of 1 to 3 percent.

Q. Do you have an understanding as to whether that rate has increased, decreased or stayed the same over the last 10 years?

A. I believe -- well, I read a lot of articles and one guy says one thing and the

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other guy says another thing. But I certainly read an article and again, I'd have to find it where they said that it has decreased.

Q. And over that same period of time, say the last 10 years, do you have an understanding -- well, let me ask you this.

Have there been any significant changes in the design of OR HVAC systems over that 10-year period?

MS. ZIMMERMAN: Object to form of the question.

THE WITNESS: Ten years.

MS. ZIMMERMAN: He's not asking you to guess.

BY MR. GOSS:

Q. If you know.

A. I don't know of any.

Q. Do you have any understanding as to whether the use of forced-air warming has increased, decreased or stayed the same over that same 10-year period?

A. I have no idea.

Q. As part of your work in this case, have you spoken to any of the individual

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plaintiffs?

A. No.

Q. Have you spoken to any orthopedic surgeons about this case?

MS. ZIMMERMAN: Plaintiff's orthopedic surgeons or --

BY MR. GOSS:

Q. Sure. We'll start with plaintiff's orthopedic surgeons. Have you --

A. No.

Q. Okay. Have you spoken to orthopedic surgeons other than those who operated on the plaintiffs?

A. Yes.

Q. All right. Who was that?

A. Joe Fulton.

Q. Okay. How do you know Joe?

A. From soccer.

Q. All right. You talked to him about this case?

A. I asked him about Bair Huggers, if he uses them.

Q. All right. And what did he tell you?

A. I think he said yes.

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Q. And he's an orthopedic surgeon?

A. I think so. He's either vascular or orthopedic. I realize there's a difference. I think he's orthopedic.

Q. All right. Other than just asking him if he uses the Bair Hugger, did you ask him any other questions?

A. No.

Q. Did you offer him any information based on your research in this case?

A. Nothing based on my research.

Q. Outside of your research, did you offer him any thoughts on the Bair Hugger?

A. Any thoughts on it? No.

Q. So other than the question, Do you use Bair Huggers, you said the answer was, you believe, yes?

A. Uh-huh.

Q. Did the two of you discuss anything else about the Bair Hugger?

A. It was strictly in the context of what are you doing these days, now that your son's not playing soccer anymore and you have all this time.

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Q. Were the two of you playing soccer or were --

A. No, no. Kids soccer.

Q. I got it. So other than Dr. Fulton, have you spoken to any other orthopedic surgeons about the Bair Hugger?

A. No.

Q. Have you spoken to any hospital engineers about the Bair Hugger?

A. Well, only in the same context of sociability, what are you up to these days and me saying, working on a case. What's the case? Bair Hugger. You ever use Bair Hugger? Yes.

Q. Did anybody that you approached or talked to in that context ever tell you they don't use Bair Hugger?

MS. ZIMMERMAN: Object to form.

THE WITNESS: No. No.

BY MR. GOSS:

Q. Did anyone that you spoke to about the Bair Hugger -- and I'm talking about hospital engineers and this sort of thing -- did anybody you spoke to about Bair Hugger in that context ever share with you any concerns

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1 KOENIGSHOFER
2 they had about the Bair Hugger?
3 A. No. Most didn't know what a Bair
4 Hugger was.
5 Q. You reviewed some published
6 literature in connection with your work on this
7 case. After reviewing some of these papers,
8 have you followed up with any of the authors of
9 the papers?
10 A. No.
11 Q. All right. We discussed earlier that
12 you read a report from Said Elghobashi. Have
13 you spoken to him one on one?
14 A. No.
15 Q. I may have covered this earlier.
16 Have you had any e-mail exchanges with
17 Dr. Elghobashi?
18 A. No.
19 Q. Have you spoken to any other ASHRAE
20 members about your work on this case?
21 A. Yes.
22 Q. Who would they be?
23 A. Mike Meteyer.
24 Q. He, if memory serves, was one of the
25 contributors to Chapter 8 of the design manual?

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1 KOENIGSHOFER
2 A. Yeah. I don't know if it was 8 or
3 not, but he's definitely a contributor.
4 Q. Okay. And what did you discuss with
5 Mr. Meteyer?
6 A. It was really more in the social
7 context of what are you up to these days.
8 Q. Is Mr. Meteyer, is he the local guy
9 that you see from time to time or how did you
10 run into him?
11 A. He's on all these committees with me
12 at ASHRAE. He's a friend. No, he lives in
13 Wisconsin.
14 Q. Other than Mr. Meteyer, have you
15 spoken to anybody else about -- from ASHRAE
16 about your work on this case?
17 A. When I saw a thing pop up that
18 Michael Keen on LinkedIn -- or no. Somehow --
19 let's see what -- how was it? I saw that he
20 was an expert witness for you guys. So I sent
21 him, on LinkedIn, a note saying, "Hey, see
22 you're on Bair Hugger. See you in court." He
23 said "10-4." And that was the discussion.
24 Q. Okay. Got it. Do you know Farhad
25 Memarzadeh?

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1 KOENIGSHOFER
2 A. I do.
3 Q. How do you know him?
4 A. From ASHRAE committees.
5 Q. What does Dr. Memarzadeh do?
6 A. He's director of some kind of lab
7 stuff at NIH.
8 Q. Have you worked with him on any
9 committees for ASHRAE?
10 A. I have been in meetings where he's
11 there. We've been engaged in discussions.
12 It's not exactly working on something per se.
13 Q. Is he someone whom you respect?
14 A. Yes.
15 Q. Have you reviewed any modeling work
16 that he has done on the use of Bair Huggers in
17 an operating room?
18 A. No.
19 Q. Do you know Russell Olmsted?
20 A. Yes.
21 Q. How do you know him?
22 A. He's on the Standard 170 Committee
23 with me.
24 Q. How long have you known him?
25 A. Five, six years.

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1 KOENIGSHOFER
2 Q. What does he do?
3 A. He's some kind of infection control
4 guy up in Michigan. He was president of APIC,
5 the association of, I don't know, prevention of
6 infection or whatever APIC stands for. I
7 believe he's an epidemiologist.
8 Q. Have you worked with him on any
9 ASHRAE committees?
10 A. Again, I've been in conversations
11 with him at the meetings. Meetings might be 20
12 people. But I've not worked with him in --
13 beyond that.
14 Q. Have you ever been in any meetings
15 with him where the Bair Hugger was discussed?
16 A. No.
17 Q. Is Russell Olmsted someone whom you
18 respect?
19 A. Yes.
20 Q. Are you familiar with any research
21 that Russell Olmsted has participated in
22 regarding the Bair Hugger?
23 A. Well, I know of the article that he
24 wrote with Sessler.
25 Q. Do you know Andrew Streifel?

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A. I do.

Q. How do you know him?

A. Same way.

Q. And what does Andrew Streifel do?

A. Well, he may be retired at this point. I don't know for a fact. But he used to be, I think at the University of Minnesota Hospital as a -- I guess -- I don't know. I don't know what he did at the University of Minnesota Hospital.

Q. Have you served on committees with Andrew Streifel?

A. Yes. He's on committees with me. He rarely actually comes to the meetings.

Q. Have you talked to Mr. Streifel about your work in this case?

A. No.

Q. Are you aware of any cases in which Mr. Streifel has served as an expert witness?

A. No.

Q. Are you familiar with an experiment that was conducted by Mr. Streifel and Michael Buck in connection with this litigation?

A. No.

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Q. So if you haven't seen it, is it fair to say that experiment does not have any connection to your opinions in this case?

A. I have not seen it, so yes.

(Thereupon, Exhibit 12 was marked for identification.)

BY MR. GOSS:

Q. Exhibit 12 is the ASHRAE Position Document on Airborne Infectious Diseases. Have you seen this position document before?

A. Yes.

Q. Is it something that you reviewed for this case?

A. No.

Q. If you look at the committee roster, Russell Olmsted is on it; correct?

A. Yes.

Q. Is there anybody else on this committee roster whom you know?

A. I've met Bill McCoy. I knew Sidney Parsons. I never met him. I was acquainted with him. He passed away. That's it.

Q. Were you involved at all in the preparation of this position statement,

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position document on airborne infectious diseases?

A. No.

Q. You mentioned earlier that you had served as a nonvoting member of the ASHRAE 170 Committee; correct?

A. Correct.

Q. And did you say you have been on the committee in that capacity since 2007?

A. Not as an official nonvoting member. You have to kind of climb your way up the committee's chain.

Q. When did you first start attending --

A. Well, I first started attending in about 2005 or something like that.

Q. Okay. And that was attending ASHRAE 170 Committee meetings, just so we have a clear record?

A. That's correct.

Q. Okay. And then when did you become a nonvoting member?

A. I don't remember.

Q. Sometime after 2005?

A. Yes. Yes. Of course.

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Q. Did you have input into the current version of that standard 170?

A. Well, again, the way these things work is you sit in the big committee and you discuss all kinds of things. And I sit at the table and I am somewhat vociferous, so I weigh in on my thoughts on the different things.

Q. Did you draft any portions of the 170 Standard?

A. No, I did not. I did not.

MS. ZIMMERMAN: Just for the record, if you -- you've got your report in front of you, but it looks like your report says you've been active in ASHRAE since 2003.

THE WITNESS: Okay.

(Thereupon, Exhibit 13 was marked for identification.)

BY MR. GOSS:

Q. Exhibit 13 is ASHRAE Standard 170-2013; correct?

A. Correct.

Q. And I notice at the top of the document, it actually says "ANSE/ASHRAE/ASHE." Have ANSE and ASHE also adopted this standard,

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2 or do you know?
3 A. That is my understanding, but I'm not
4 positive about that.
5 Q. Would you say that ASHRAE standards
6 are intended to promote best practices in HVAC
7 design?
8 MS. ZIMMERMAN: Object to form.
9 THE WITNESS: They're minimum
10 standards.
11 BY MR. GOSS:
12 Q. What do you mean by that?
13 A. Well, it's the minimum that you
14 should design to. If you want to design to
15 more and get into best practices, that's fine.
16 Q. Okay. But if someone were to comply
17 or if a hospital were to comply with ASHRAE
18 170, would there be any reason to think that
19 that hospital HVAC system is somehow unsafe?
20 MS. ZIMMERMAN: Object to the form of
21 the question.
22 THE WITNESS: Can you rephrase that
23 for me?
24 BY MR. GOSS:
25 Q. Sure. In other words, if you're

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1 KOENIGSHOFER
2 putting out a standard, you're intending for
3 people to follow it; right?
4 A. Yes.
5 Q. And what's the goal behind the
6 standard? Just in general.
7 A. Well, I think kind of the wording is
8 important. The purpose of the standard is to
9 define ventilation system design requirements
10 that provide environmental control for comfort,
11 asepsis and odor in healthcare facilities.
12 Q. And for a hospital that wants to --
13 why would a hospital want to comply with this
14 standard?
15 MS. ZIMMERMAN: Object to form.
16 Foundation.
17 BY MR. GOSS:
18 Q. Aren't they looking to comply with
19 best practices in the industry?
20 MS. ZIMMERMAN: Same objection.
21 THE WITNESS: They are looking to
22 comply with the various codes.
23 BY MR. GOSS:
24 Q. And so it's strictly a legal matter
25 that they want to comply with building code?

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1 KOENIGSHOFER
2 A. I can't -- I can't speak for all
3 hospitals.
4 MS. ZIMMERMAN: I'm going to object
5 to the form of question. He doesn't
6 have --
7 Q. What about hospitals that you've
8 consulted with? Have you consulted with
9 hospitals that have sought to comply with
10 ASHRAE 170?
11 A. That have sought to?
12 Q. Yes, sir.
13 A. Yes.
14 Q. And what's your understanding from
15 working with those hospitals? What is their
16 goal in engaging you to comply with 170?
17 MS. ZIMMERMAN: Object to form.
18 Foundation.
19 THE WITNESS: They are hiring me as
20 an engineer to design to meet these
21 regulations.
22 BY MR. GOSS:
23 Q. Has this been adopted by the federal
24 government or any state government, to your
25 knowledge?

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1 KOENIGSHOFER
2 A. This is part of the FGI guide for
3 hospital construction. It has been adopted by
4 that. And it's my understanding that about 40
5 states have adopted that as their building
6 code.
7 Q. But -- so it's your testimony that
8 this document is only intended to convey the
9 bare minimum --
10 A. Yes, sir.
11 Q. -- for compliance with HVAC
12 guidelines in hospitals?
13 A. Yes.
14 Q. And is that -- have you ever talked
15 to any of your fellow ASHRAE 170 Committee
16 members about whether this should incorporate
17 more than simply the bare minimum for
18 compliance with HVAC guidelines?
19 A. Yes.
20 Q. Okay. And have you contributed edits
21 or changes that are reflected in this standard
22 to adopt more than the bare minimum for
23 compliance?
24 A. Probably not what you just passed out
25 right here, but I have contributed some words

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to some of the addenda that have come out more recently. I don't know how many addenda you have on this thing right here. They come out every month, every other month.

Q. What -- what addenda do you recall contributing to? What was the subject matter of the addenda?

A. The subject -- well, of addenda that have been adopted? I would really have to refer back to my notes on that one to remember which one, to which it applied.

Q. Is it your testimony that ASHRAE 170, Standard 170 has nothing to do with the best practices for HVAC design in healthcare facilities?

MS. ZIMMERMAN: Object to form. Misstates his testimony.

THE WITNESS: I would not make that statement.

BY MR. GOSS:

Q. Okay. So it does have something to do with best practices in the ventilation of healthcare facilities; is that right?

MS. ZIMMERMAN: Object to form.

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THE WITNESS: Yes.

BY MR. GOSS:

Q. And that's something that a hospital looking to comply with Standard 170 is going to be interested in as best practices for ventilation of healthcare facilities; correct?

MS. ZIMMERMAN: Object to form. Foundation.

THE WITNESS: Again, you asked me about hospitals. I can't speak. There are 10,000 people that work at a hospital.

BY MR. GOSS:

Q. Well, you've worked with a lot of hospitals over the years, have you not?

A. I have.

Q. And those hospitals are interested in your expertise on best practices; correct?

MS. ZIMMERMAN: Object to form.

BY MR. GOSS:

Q. In HVAC design for the ventilation of healthcare facilities; true?

A. Yes.

Q. All right. 170 covers a wide range of topics, but one of the topics that's

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covered, of course, is filtration; correct?

A. Yes.

Q. All right. And if you look at table 6.4, it discusses minimum filter efficiencies?

A. Yes.

Q. On page 5; correct?

A. Yes.

Q. It says, "Operating rooms for Class B and C surgery require, in filter bank number 1, a MERV 7 filter and in filter bank 2, a MERV 14 filter; is that correct?"

A. Correct.

Q. All right. First of all, let's explain what MERV is. What does that stand for?

A. Well, it's something like minimum efficiency -- always forget exactly what MERV stands for. It has something to do with minimum efficiency rating value or something like that.

Q. And do you know how MERV --

A. Minimum Efficiency Reporting Value.

Q. Okay. Do you know how MERV ratings are calculated for air filters?

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A. I know something about it, yes.

Q. Are you familiar with the ASHRAE standard for calculating MERV ratings for air filters?

A. In a general way. I'm not on Standard 52.

Q. But it's Standard 52.2; correct?

A. 52.2, I believe that's the latest.

Q. All right. So coming back to this table 6.4, is it fair to say that filter bank number 2 in this table, is that the terminal filtration? In other words, the last filter before the air goes to the room?

A. It's the last filter in the system.

Q. In the system. And this provides for a MERV minimum of 14; correct?

A. Correct.

Q. Have you ever taken a position in any committee meetings for 170 that that value should be higher?

A. I've certainly been involved in a lot of discussions about it.

Q. Have you personally recommended to the committee that the final filter in the

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system for an operating room -- for -- should be higher than 14?

A. Not for a general operating room.

Q. What about other than for a general operating room?

A. I have suggested that maybe we should start requiring it for orthopedic operating rooms.

Q. And you suggested this during a committee meeting of -- of the 170 Committee?

A. Yes.

Q. Did you make that recommendation -- when do you recall making that recommendation?

A. As Jim said, I've been going to these meetings for 14 years, two or three a year for 14 years. I honestly can't remember at what point.

Q. Was it in the last two years?

A. I would say probably before that.

Q. Has it been your experience that orthopedic rooms sometimes do incorporate HEPA filters?

A. Yes.

Q. And nothing in this table would

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prevent an orthopedic room from doing that; correct?

A. That's correct.

Q. In your -- in the various meetings you've attended for Standard 170, do you have any understanding as to whether the committee intends to increase the minimum filter requirements for Class B and Class C surgery?

MS. ZIMMERMAN: Object to form.

THE WITNESS: Among the addenda on the table at this time, that is not one of them.

BY MR. GOSS:

Q. Where it says "Class B and Class C surgery," am I correct that orthopedic surgery would be encompassed within one of those classes?

A. Yes.

Q. Which one is it?

A. It's probably the Class C, I would assume.

Q. And the only space designation on this table 6.4 that calls for HEPA is a protective environment room; correct?

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A. That's correct.

Q. And this protective environment room, is that where you put someone who is contagious with a respiratory illness, for example?

A. No, just the opposite.

Q. It's where you put somebody who's susceptible that you need to protect?

A. Correct.

Q. Okay. Are the HEPA filters in protective environment rooms, are they on the inflow to the room or the outflow from the room?

A. Inflow.

Q. If you'll turn with me to page 14, section 7.4 talks about surgery rooms. And if you look at point A, it says, "The airflow shall be unidirectional downwards and average velocity of the diffuser shall be 25 to 35 cubic feet per minute per square foot."

Are you familiar with that requirement for the face velocity or volume metric flow out of the diffusers?

A. Yes.

Q. And it says here, "For further

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information, see Memarzadeh and Manning 2002, and Memarzadeh and Jeong in informative appendix B." Are you familiar with the Memarzadeh and Manning paper on this subject?

A. Yes.

Q. So what is -- what is the reason that Memarzadeh and Manning gave for setting the airflow volume and velocity at 25 to 35 CFMs per square foot?

A. Well, it was to get adequate air changes, 20 per square foot -- I'm sorry, 20 air changes per hour. And given the size the laminar diffuser is going to be, roughly the size of the table plus a foot or two on each side, you have to have a certain amount of airflow to get those air changes.

Q. Okay. But is there something about this particular velocity that's important, the 25 to 35 CFMs?

A. Memarzadeh hypothesized about a wound plume.

Q. Tell me about that. What does he mean by "wound plume"?

MS. ZIMMERMAN: Object to form.

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Foundation. You can answer if you know.

THE WITNESS: My understanding is that he felt like there's a small amount of heat coming off of an exposed part of the body, which would cause a convective updraft and that little thermal mushroom cloud would contain only the bugs from that patient. And, therefore, you do not want your velocity from your diffusers to be so great that it blows away that wound plume.

BY MR. GOSS:

Q. So Memarzadeh and Manning, did their research involve computational fluid dynamics, if you know?

A. Yes.

Q. You're familiar with the paper from 2002?

A. Yes.

Q. And the wound plume, as you described it, has a protective effect for surgical site infection. Isn't that what's hypothesized, at least, in the article?

A. Yes.

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Q. Do you believe that to be true?

A. I am skeptical that the temperature of the wound would be sufficient to cause much of a mushroom cloud.

Q. But if it did cause a slight thermal updraft, is it your opinion that that would be protective for purposes of preventing surgical site infections?

A. Yes.

Q. And so the point of limiting the velocity of the diffusers to 35 CFMs -- I may have -- I may have my units wrong. Is it feet per minute?

A. We are talking feet per minute velocity.

Q. Feet per minute is velocity. Okay. So the whole idea behind limiting the velocity to 35 feet per minute is to avoid overcoming whatever protective updraft may be coming from the patient; is that correct?

MS. ZIMMERMAN: Object to form. Foundation.

THE WITNESS: Say it again.

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BY MR. GOSS:

Q. The reason for limiting the velocity to 35 feet per minute is to avoid disrupting the protective plume on the patient, or do you know?

A. It is my understanding that is Memarzadeh's thinking.

Q. Is that how you pronounce it? Thank you. I didn't know.

A. Yes.

Q. Memarzadeh. I'm glad to know that.

MS. ZIMMERMAN: I've been saying it wrong the whole time.

BY MR. GOSS:

Q. I was saying it like marmalade.

A. Pretty much all of us just call him Farhad.

Q. Farhad. Okay.

A. It's a lot easier.

Q. All right. And Memarzadeh's thinking has been incorporated into Standard 170 by limiting the velocity of the diffusers to 35 feet per minute; correct?

MS. ZIMMERMAN: Objection to form.

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Foundation.

THE WITNESS: That is my understanding. That was written before I was on the committee.

BY MR. GOSS:

Q. Okay. But obviously they're citing his paper right here where they talk about the diffuser shall be 25 to 35 feet per minute; correct?

A. Yes.

MS. ZIMMERMAN: We've been going about an hour.

BY MR. GOSS:

Q. Let me take a quick look here. This might be a pretty good place to stop.

The only other thing I was going to ask you about in this section. So we talked about how you may have or you contributed to some addenda for Standard 170; correct?

A. Well, I've contributed in -- I don't know that a word that I have written has been in there. But, I mean, I've deleted words and changed some things. These things go around the table many times.

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Q. As a nonvoting member, do you have authority to make line edits to the standard?

A. Authority? I'm asked to.

Q. Okay. And if -- as you sit here today, can you remember any specific edits that you would have made to Standard 170, the 2013 version of it?

A. No.

MR. GOSS: Let's take a break.

THE VIDEOGRAPHER: Off record at 12:33 p.m.

(Thereupon, a brief recess was taken.)

THE VIDEOGRAPHER: Back on record, 1:45 p.m.

BY MR. GOSS:

Q. Welcome back from lunch, Mr. Koenigshofer.

I had a chance over the lunch break to look at these notebooks of materials provided as Exhibits 2 and 3. We also copied your notebook, which we marked as Exhibit 4.

Just for the record, the copy is what we're going to actually have the court reporter take with her as Exhibit 4 and your original

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notebook will stay with you.

A. Okay.

Q. A couple questions about Exhibits 2 and 3. I noticed on the -- on some of the expert reports, for example, I'll just call out this Bates number, BHDK456. This is Jim Ho's report. There is some comment balloons.

A. Yes.

Q. Are those -- and highlighting.

A. Yes.

Q. Are those your highlights and comments?

A. The comments are all mine.

Q. Okay.

A. In the, you know, original online electronic, some of those things that are Gen -- Gabe sent to me -- they -- I guess it was they -- I don't know. They came to me, let's just put it that way. They came to me with some underlining.

Q. Okay.

A. And then I added underlining --

Q. All right. Well, I'm not --

A. -- in a slightly different color.

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Q. Okay. Some of them were prehighlighted for confidential stuff by defense counsel.

MS. ZIMMERMAN: I was going to say.

And I think that the highlighting actually came from you.

MR. GOSS: Okay. Yeah. That sounds right.

THE WITNESS: I didn't know where it came from.

BY MR. GOSS:

Q. But then you added some highlights to that?

A. Yes, sir.

Q. And then the comment balloons, I just want to make sure, these are not comment balloons from counsel. These are your comment balloons; correct?

A. That's correct.

Q. All right. And I don't have these comment balloons, I don't have the content of them. Are they captured somewhere?

A. Slightly erratically after making some number of comments, I'm not sure which one

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I started with, I said, this is not going to work out very well. So I started a Word document with, you know, one, two, three, four, five comments --

Q. Okay.

A. -- which Gabe assures me is someplace in that booklet.

Q. Yup. And I've seen that.

MR. GOSS: I guess what I would ask too is -- is if you can provide the -- the versions of these documents with the comments, so that we have those, since they're your comments. That would be appreciated.

MS. ZIMMERMAN: And we're going to be getting all of these from your experts as well?

MR. GOSS: I don't know that mine have made any comments.

MS. ZIMMERMAN: Right.

MR. GOSS: It's just they're there and I have to ask.

MS. ZIMMERMAN: We will -- we'll work to get you it again.

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2 MR. GOSS: Okay. Let's see.

3 MS. ZIMMERMAN: If there are -- as
4 you're reviewing this -- you don't have to
5 to do it right now -- but if there are
6 specific Bates numbers where you're
7 looking for comment bubbles and you want
8 them, do you want to maybe let us know
9 what they are?

10 MR. GOSS: Well, the problem is I
11 don't know exactly how these comments made
12 up to his list, because it's not like
13 they're numbered footnotes. So...

14 MS. ZIMMERMAN: Right, yeah. No,
15 we -- we'll do what we can.

16 MR. GOSS: Okay.

17 BY MR. GOSS:

18 Q. So I noticed on your -- I think it's
19 your first invoice from June of 2016 -- this is
20 BHDK1444 -- you have an entry for OR load count
21 and calc OR supply count.

22 What -- what does that refer to?

23 A. I was asked, maybe I volunteered, I
24 don't know -- anyway, to give an estimate of --

25 Q. Do you need to see it or --

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2 A. No.

3 Q. Okay.

4 A. -- of what the cooling load is in the
5 operating room, so I provided that.

6 Q. Okay.

7 A. And then I was asked what would
8 temperature differential need to be in order to
9 meet that load. It might be in the photographs
10 from my journal or --

11 Q. Okay.

12 A. -- notebook, whatever you call it.

13 Q. So I'll show you an example -- I'm
14 not going mark this -- but this is Bates
15 numbers 1504 and 1505.

16 Does that look like a load
17 calculation?

18 A. Um-hmm. Yes.

19 Q. Okay. Were you asked to do anything
20 else with that load calculation after you
21 calculated it?

22 MS. ZIMMERMAN: And just for the
23 record, I'm going object to the extent
24 that you're calling for potentially work
25 product privileged information.

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2 MR. GOSS: Okay.

3 MS. ZIMMERMAN: I'm letting you get
4 into his some of his notes because you've
5 asked for it in a subpoena. I think that
6 within our rights we certainly could have
7 withheld some of this.

8 MR. GOSS: Okay.

9 MS. ZIMMERMAN: But in the interest
10 of full disclosure we provided it.

11 MR. GOSS: Okay.

12 BY MR. GOSS:

13 Q. Well, let me ask it this way then:
14 Does your load calculation figure in any way
15 into your opinions in this case?

16 A. It does.

17 Q. How so?

18 A. I feel that the heat output of a Bair
19 Hugger is -- adds a significant amount of load
20 to the operating room.

21 Q. All right. And when you did this
22 load calculation, did you include heat from a
23 Bair Hugger?

24 A. I would have to look at that to -- to
25 remember.

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2 Yes.

3 Q. And I noticed you indicate here BH is
4 a thousand watts; is that right?

5 A. Yes.

6 Q. All right. Where did you get that
7 figure?

8 A. Gosh, I feel like I saw it in some
9 materials from Bair Hugger.

10 Q. Did you look at the Bair Hugger
11 operating manual for wattage of the warming
12 unit?

13 A. I did. And I know that it varies
14 from, I don't know, maybe 400-watts up, and
15 that's whether it's on low or high and --

16 THE REPORTER: I'm sorry. I can't
17 hear you.

18 THE WITNESS: Okay. There's a
19 variety of models. I'm not sure which
20 model I was referring to there. And in
21 any case -- what was the second question?

22 BY MR. GOSS:

23 Q. So you assumed that the Bair Hugger,
24 in your load calculation, would be putting out
25 a thousand watts continuously into the OR

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 2 during a procedure?
 3 MS. ZIMMERMAN: Object to form.
 4 BY MR. GOSS:
 5 Q. Or did you assume that?
 6 A. I assumed in the instantaneous
 7 calculation I did there that it was putting out
 8 1,000 watts. The calculation does not make any
 9 statements about being a day, a year, forever.
 10 Q. Do you have any understanding as to
 11 whether the Bair Hugger warming unit will
 12 continue at its peak wattage throughout its
 13 operation during a surgical procedure?
 14 A. I don't know that it would run at its
 15 peak. But if it's bringing in 65-degree air
 16 and it's putting out 110-degree air, it will
 17 continue to use exactly that amount of energy,
 18 as long as it continues in those conditions.
 19 Q. Okay. This is from BHDK number 131.
 20 Does that -- you can look at the
 21 front page too. But are those -- do those
 22 appear to be specifications for the Bair Hugger
 23 750 warming -- warming unit?
 24 MS. ZIMMERMAN: Counsel, are you
 25 representing to the witness that's what

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 2 this is or...
 3 MR. GOSS: It's his document. I'm --
 4 THE WITNESS: It appears to be the
 5 specifications -- it states that it's the
 6 specifications from Bair Hugger model 750.
 7 BY MR. GOSS:
 8 Q. Okay. All right. And then the
 9 wattage specified there, I believe it says --
 10 A. Heating element is 1400 watts
 11 resistive.
 12 Q. Okay.
 13 A. Peak consumption is 1550. And the
 14 average is 800.
 15 Q. Okay. But what you used in your
 16 calculation was a thousand?
 17 A. Yes, sir.
 18 Q. All right. I'll take that back.
 19 Do you have any understanding as to
 20 whether the 505 model has a higher or lower
 21 energy consumption than the 750?
 22 A. I believe it's lower.
 23 Q. Okay. I'm just going to ask you
 24 about this note, BHDK1495, from March of '16.
 25 And towards the top there's a note from a call

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 2 where you say you suggested a test.
 3 Do you see that?
 4 A. Uh-huh. Yes.
 5 Q. And did you actually suggest a test
 6 be done or that you would do a test for your
 7 work on this case?
 8 A. No, not I. I believe that Ben and
 9 Gabe had said --
 10 MS. ZIMMERMAN: And again, I'm
 11 going -- to the extent we're getting into
 12 work product, I'm going to instruct the
 13 witness not to answer.
 14 BY MR. GOSS:
 15 Q. All right. In any event --
 16 A. I believe what I've written here
 17 stands --
 18 MR. ASSAAD: There's no question.
 19 THE WITNESS: -- speaks to itself.
 20 BY MR. GOSS:
 21 Q. Okay. So you did no test; correct?
 22 A. Correct.
 23 Q. All right. Showing you BHDK1503.
 24 Is that a drawing of a Bair Hugger
 25 unit with some numbers around it?

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 2 A. Yes.
 3 Q. For lack of a better description.
 4 A. It is.
 5 Q. All right. There's a number at the
 6 bottom, 450 FPM.
 7 A. Yes.
 8 Q. That's the intake velocity at the
 9 floor. Is that -- did I interpret that
 10 correctly?
 11 A. That is the calculated intake
 12 velocity, yes.
 13 Q. Okay. So did you -- did you
 14 calculate that intake velocity?
 15 A. Yes.
 16 Q. All right. Do you have notes from
 17 that calculation in here?
 18 A. Right there.
 19 Q. Oh, it's right there. Okay.
 20 All right. So you measured that --
 21 so you multiplied the area by the velocity to
 22 get to 450 feet per minute, is that basically
 23 it?
 24 A. The volume, yes.
 25 Q. The volume. Thank you.

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Okay. Yeah. Because it's four by four --

A. The volume by the area, you got the speed.

Q. Understood.

All right. So with that value, 450 feet per minute -- well, let me make sure I understand that.

The 50 CFMs, I think we discussed that earlier, that that -- was that based on the specification that says the Bair Hugger will deliver up to 48 CFMs?

A. Yes.

Q. All right. Did you do anything with that number, the 450 feet per minute? Did you do any calculations based on that number?

A. No.

Q. Okay.

MS. ZIMMERMAN: Counsel, just to -- and I know I'm jumping in here. But to the extent there are any other notes that may have been inadvertently produced that are work product, such as the bill, I'm going to ask that we claw those backs.

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And if there are additional ones in there that we inadvertently produced, we will maintain our work product privilege on those.

MR. GOSS: Okay.

BY MR. GOSS:

Q. This will be the last one for now. BHDK1498. The title at the top is "Reduction of IAQ without Bair Hugger."

And you have an OR diagram with personnel in it; correct?

A. Yes.

Q. And some numbered items around it?

A. Yes.

Q. And based on the title, I assume what you're describing there is -- looks like there are 10 different things that can reduce indoor air quality with or without a Bair Hugger; is that right?

A. Yes.

Q. Okay. So these are all things that will happen regardless of whether a Bair Hugger is in the room?

A. Yes.

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Q. All right. I'll take that back.

Okay. Does ASHRAE sometimes make recommendations or adopt standards that are not based on randomized controlled, clinical trials?

MS. ZIMMERMAN: Pardon me. Object to form and foundation.

THE WITNESS: I can't speak for ASHRAE.

BY MR. GOSS:

Q. Okay. Are you aware of any standards that ASHRAE has adopted that are not backed by clinical trial data?

MS. ZIMMERMAN: Same objection. Form and foundation.

THE WITNESS: I'm not. I don't know.

The short answer to that question is, I don't know.

BY MR. GOSS:

Q. Okay. Are you aware of any controlled clinical trials comparing the effectiveness of different HVAC interventions on the incidence of surgical site infections?

A. Well, I've certainly read articles

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about Ultra Clean airflow.

Q. Okay. Are you familiar with any clinical trials comparing Ultra Clean versus conventional HVAC systems that have found a statistically significant difference in the incidence of surgical site infection?

A. You know, I know there's an article that addresses that. And, you know, I'd have to pull it out and take a look at it.

Q. Right now can you think of a clinical trial that you can recall that found a statistically significant difference in infection rate based on the HVAC intervention alone?

A. Well, again, I read one that addresses that, and I can't exactly remember if they gave me statistics or not in there. I think they were -- it was a Dutch --

Q. Setting aside --

A. -- group that did it.

Q. Okay. Setting aside the statistics, just in general, do you recall a study that looked at, do we have more infections or fewer infections in one type of OR HVAC design versus

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2 another?

3 MS. ZIMMERMAN: I'm going to object
4 as asked and answered three times. And
5 he's going to give you the same answer
6 each time.

7 MR. GOSS: I heard -- I think he was
8 not tracking my question, so that's why I
9 tried it another way.

10 THE WITNESS: I -- I don't know of
11 any, to answer your question.

12 BY MR. GOSS:

13 Q. Thank you. Thank you.

14 We were talking earlier about MERV
15 ratings for filters. Do you have an
16 understanding from your experience with ASHRAE
17 as to why we have MERV ratings versus any other
18 type of system for categorizing air filters?

19 A. My general understanding -- again,
20 I'm not on that committee, 52. But I don't
21 know. Up until 10 years ago or something,
22 people talked about dust spot, and they would
23 talk about a filter being 90 to 95 percent.
24 And it was quite generic exactly what that
25 meant. And it became clear that not everybody

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2 had the same understanding.

3 And so the ASHRAE 52 Committee took
4 it upon themselves to write a standard. And I
5 guess it is they who came up with the MERV --
6 the whole MERV concept, which is based on
7 efficiency arrestants for different size
8 particle categories.

9 Q. Do you know what the particle ranges
10 are that they test?

11 A. You know, I think it's up to .3 and
12 then it's .3 to 1 or .3 to 5, or something like
13 that. Maybe I shouldn't answer this question
14 without looking at my book. Because I do know
15 where to find it in my book.

16 Q. Okay.

17 MS. ZIMMERMAN: Go ahead.

18 BY MR. GOSS:

19 Q. I have actually something -- I have a
20 standard I can share with you too, which would
21 probably be --

22 A. Sure.

23 Q. -- a more --

24 A. Well, actually, it's in my report.
25 That's even better. Faster place to find it.

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2 So would you like for me to find this
3 in here?

4 Q. Well, I've got the standard I can
5 give you, but if you want to point me to it in
6 your report, that would be fine.

7 A. Okay. It's on page 12, which is a
8 table from the ASHRAE Standard 52.2.

9 Q. Okay.

10 A. So the categories are .3 to 1
11 micron -- 1 to 3 microns and 3 to 10 microns.

12 MR. GOSS: Okay.

13 Go ahead and mark this.
14 (Thereupon, Exhibit 14 was marked for
15 identification.)

16 MS. ZIMMERMAN: Counsel, as you're
17 looking through notes, I would just say
18 that we are -- we're not offering
19 Mr. Koenigshofer on filter or ASHRAE
20 ratings or MERV ratings, so...

21 MR. GOSS: Okay. Other than what's
22 in his report?

23 MS. ZIMMERMAN: Correct.

24 MR. GOSS: Okay.

25 MS. ZIMMERMAN: How -- how the MERV

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2 standard is derived, I guess.

3 BY MR. GOSS:

4 Q. Okay. What is marked as MERV --
5 sorry, MERV. Exhibit 14 --

6 A. Yes.

7 Q. -- is ASHRAE Standard 52.2 2017;
8 correct?

9 A. Yes.

10 Q. Have you seen this document before?

11 A. I know of its existence. I have not
12 read it carefully.

13 Q. Okay. Do you know the difference
14 between 52.2 2017 and the prior version?

15 A. I think my short answer would be, no,
16 I don't.

17 Q. All right. If you turn to page 45,
18 which is table E1.

19 A. Yes.

20 Q. All right. This is a list of -- it's
21 a table that describes the different MERV
22 categories; correct?

23 A. Yes.

24 Q. All right. And in that top bracket
25 we have MERV 13 to 16; correct?

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2 A. Yes.

3 Q. All right. And it says under
4 "typical control contaminant," first it says,
5 ".3 to 1 micron particle size." And then it
6 says, "all bacteria." Correct?

7 A. Yes.

8 Q. All right. Do you agree that MERV 14
9 filters are appropriate for controlling all
10 bacteria?

11 MS. ZIMMERMAN: Object to form.
12 Foundation.

13 BY MR. GOSS:

14 Q. Or do you know?

15 A. I don't know.

16 Q. So you don't have an opinion either
17 way on whether a MERV 14 filter is appropriate
18 for controlling all bacteria?

19 MS. ZIMMERMAN: Object to form.

20 Q. True? Or do you have an opinion that
21 MERV 14 filters are or are not appropriate for
22 controlling all bacteria?

23 A. I don't know.

24 Q. Okay. But are you going to offer an
25 opinion as to the appropriateness of a MERV 14

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2 filter for controlling bacteria?

3 A. I would trust the 52.2 experts.

4 Q. Have you seen any literature
5 describing the capability of MERV 14 filters to
6 capture bacteria?

7 MS. ZIMMERMAN: Counsel, I guess I
8 just -- I'm going to make an objection for
9 the record. You're asking him questions
10 about the HVAC system and MERV filters in
11 an HVAC system, and I'm afraid that it's
12 more broadly applicable the way that
13 you're asking it.

14 MR. GOSS: I'm asking him about his
15 opinions in this case.

16 MS. ZIMMERMAN: Okay.

17 MR. GOSS: And is he offered --

18 MS. ZIMMERMAN: In an HVAC context?

19 BY MR. GOSS:

20 Q. Well, let me ask you this: Are there
21 any ASHRAE standards that apply to fan-blowing
22 equipment in an operating room?

23 A. Not that I know of.

24 Q. So if an equipment manufacturer
25 wanted to adopt the best practices for

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2 filtration in an operating room, is there
3 anywhere where they would turn other than
4 ASHRAE standards?

5 MS. ZIMMERMAN: I'm going to object
6 to this as way outside the scope of the
7 report that he's prepared and the
8 expertise he's prepared to offer, and also
9 that he doesn't have foundation to answer
10 your question.

11 MR. GOSS: Okay.

12 BY MR. GOSS:

13 Q. You can answer the question.

14 A. Ask the question again.

15 Q. An equipment manufacturer -- we
16 established that there is no ASHRAE standard
17 for fan-blowing equipment in an OR, correct,
18 that you're aware of?

19 A. None not that I know of, yes.

20 Q. Okay. But if an equipment
21 manufacturer that made a device that uses a fan
22 wanted to approximate best practices for air
23 filtration in an operating room, would it not
24 be appropriate for that manufacturer to refer
25 to ASHRAE standards?

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2 MS. ZIMMERMAN: Again, I'm going to
3 object because he is not -- object to
4 form. It misstates the testimony that
5 he's provided with respect to best
6 practices versus minimum standards. And
7 that's not a fair question posed to this
8 particular witness.

9 MR. GOSS: That is a speaking
10 objection. So you can answer.

11 THE WITNESS: My expertise is in HVAC
12 and filtration of HVAC systems. I
13 couldn't speak for what a medical device
14 would be doing or where it would be
15 located or how it would be operated. I
16 don't know.

17 BY MR. GOSS:

18 Q. Okay. But there are --

19 A. It would be different.

20 Q. But there are statements in your
21 report that concern the filtration of the Bair
22 Hugger; correct?

23 A. Yes.

24 Q. And are you not applying your
25 expertise and experience and your time with

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ASHRAE and your understanding of ASHRAE standards to the Bair Hugger filters in arriving at those statements and opinions in your report?

A. Yes.

Q. And so wouldn't it be fair for a manufacturer of a fan-blowing piece of equipment to also refer to ASHRAE standards with respect to equipment that is used in an operating room?

MS. ZIMMERMAN: I'm going to object again on form. Foundation. This is not what this witness is being asked to testify about.

THE WITNESS: I can't answer the question what a -- what a medical equipment guy should do or not do.

Q. Okay. So --

A. It's not my schtick.

Q. So where else should a manufacturer -- so you -- you have opinions that are critical of the filter in the Bair Hugger unit; correct?

A. Yes, I do.

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A. Yeah, yeah. He was -- I was trying to think of this other name here. There was an article that he wrote with someone else that was actually in the 2003 version --

Q. Right.

A. -- of the design guide.

Q. That's Kowalski and Bahnfleth?

A. Oh, Bahnfleth. Right.

Q. Bahnfleth.

A. Bahnfleth, right.

Q. All right. So this is Chapter 8 from his book on Hospital Airborne Infection Control.

Have you reviewed that book?

A. I have not reviewed the book.

Q. If you'll turn with me to page 119, there's a table here, table 8.2. It says, "Airborne nosocomial pathogen removal rates." And it's got different MERV filter model filtration efficiencies listed across the top; correct?

A. Yes.

Q. And different microbes are listed in the table; correct?

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Q. All right. So what standards would you direct a filter -- a manufacturer of medical equipment to rely on with respect to equipment used in the OR?

MS. ZIMMERMAN: Objection. Foundation.

Q. Where would you send them?

MS. ZIMMERMAN: Objection. Foundation.

THE WITNESS: The ASHRAE 52 Committee.

MR. GOSS: Okay. Thank you. (Thereupon, Exhibit 15 was marked for identification.)

BY MR. GOSS:

Q. Showing you Exhibit 15. This is an excerpt from a book by Wladyslaw Kowalski.

Do you know who Mr. Kowalski is?

A. I don't know him, but I know the name.

Q. Are you familiar with other work by Kowalski?

A. Yes. Yes.

Q. And you cite him in your report.

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A. Uh-huh. Yes.

Q. All right. And if you look at the MERV 14 column, it lists efficiencies, a capture of different microbes; correct?

A. Yes.

Q. All right. So if you go down to pseudomonas aeruginosa, that's got an 84 percent capture at MERV 14; correct?

A. I haven't found it. Where are you on the table there?

Q. About halfway down.

A. Correct.

Q. All right. And then if you go a little bit further down to staph aureus and staph epidermis, those are at 97 percent for MERV 14; correct?

A. Yes.

Q. And then you go to acinetobacter, enterobacter cloacae and enterococcus, those are all at 99 percent; correct?

A. Yes.

Q. All right. Do you have any basis or any knowledge to dispute the figures that are listed on this table?

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A. No.

Q. Have you ever read any literature that discusses whether HEPA filters are overkill when it comes to capturing bacteria?

MS. ZIMMERMAN: Object to form.

THE WITNESS: Ask me the question again.

BY MR. GOSS:

Q. Sure. Have you reviewed any literature that says that HEPA filtration is more filtration than is really necessary for capturing bacteria?

A. Yes. I have read an article that claims that, yes.

Q. Okay. If you turn to page 124, please. There's a discussion there about HEPA filters. And it says, "HEPA filters were originally designed for use in filtering radioactive particles, hence, the specification of 99.97 efficiency at .3 microns. This level of performance may be adequate for radioactive isotopes, but for purpose of filtering airborne microbes, it would appear to be overkill." Citing Luciano 1977.

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Do you disagree with that statement?

A. One man's overkill may not be another man's overkill.

Q. Okay. Are there costs associated with putting HEPA filters in an OR HVAC system?

A. Yes.

Q. That includes the cost of the equipment; correct?

A. Well, the filter itself, yeah.

Q. But then over time it's also the cost of running the equipment; right?

A. That's correct.

Q. Because the -- a HEPA filter is going to have greater resistance to airflow; is that right?

A. Yes.

Q. Okay. Because of that greater resistance to airflow, would you agree that HEPA filters are also more susceptible to creating leaks in an HVAC system in and around the filter?

A. In theory, yes.

Q. Have you ever found leaks in an OR HVAC system that used HEPA filters?

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A. I've never done filter testing.

Q. Okay. All right. Kowalski goes on to say, "It can be seen from table 8.2" -- that we just reviewed -- "that MERV rated filters can have very high removal rates for airborne nosocomial pathogens. The added benefit of using HEPA filters in healthcare is minimal, while the energy cost and first cost are high."

Do you disagree with that last sentence?

A. Again, everybody has their definition of the word "minimal." If you're the guy that got the one in a million bacteria, then you probably don't think it's a minimal.

Q. Would the same be true for, say, the HVAC system with the Plexiglass curtains, that if you're the guy who was the one in a million and he says, boy, that could have made a difference, he might not think it's a minimal benefit?

A. Yes.

Q. All right. Then Kowalski goes on to say, "Furthermore, the basis for requiring removal rates as high as those of HEPA filters

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is debatable. A simple reduction of 70 to 90 percent of airborne pathogens may be sufficient to reduce risks to an acceptable minimum."

Do you disagree with that statement?

A. I don't know what his definition of the word "acceptable" is.
(Reporter clarification.)

BY MR. GOSS:

Q. Okay. Is it your feeling that you need to have 100 percent elimination of pathogens by an OR HVAC system in order to be acceptable?

MS. ZIMMERMAN: Object to form.

THE WITNESS: There's probably no system or device that's 100 percent perfect.

BY MR. GOSS:

Q. Do you have a threshold for what you would consider to be acceptable in terms of reduction of airborne pathogens?

A. I rely on the 170, the MERV 14.

Q. There's a statement just below here. It says, "A HEPA filter operated at a face

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velocity of 500 feet per minute will allow over 10 times as many microbial penetrations as one operated at the design velocity of 250 feet per minute. And will more closely resemble a MERV 15, 16 filter than a HEPA in terms of performance."

Have you ever reviewed any data that would be consistent with what Kowalski is saying here, that a HEPA filter operated at a higher face velocity will have reduced performance in --

A. Yes. I have seen. Perhaps, they show that on the websites of manufacturers.

Q. And so --

A. American Air Filter.

Q. -- isn't that part of why you can't say that any system is 100 percent effective, even a HEPA system isn't 100 percent effective at capturing microbes; correct?

A. That's correct.

MS. ZIMMERMAN: Object to form.
BY MR. GOSS:

Q. So in your report, on page 3 you talk about the question presented.

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A. Page 4?

Q. Page 3, sir.

A. Yeah.

Q. Okay. And you say you are asked to explain the environment of use for the Bair Hugger device, which is a hospital operating room. And I just want to ask you some questions about that.

We just -- we just said that no HVAC system, no OR HVAC system is going to be 100 percent effective at controlling microbes; correct?

A. Yes.

Q. All right. So an operating room is not the same as, say, a clean room for semiconductor manufacturing?

A. I don't know. I don't know clean room design.

Q. Okay. Have you ever worked on clean room, designing one?

A. On a semiconductor cleaning room, that kind of clean room?

Q. Really any kind of clean room.

A. Well, kind of guessed your definition

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of a clean room.

Q. Okay.

A. I mean, I've worked on pharmacies.

Q. Okay. So how does a -- I guess my question is, is the air -- is the HVAC system in the operating room designed to sterilize the air? Is that even possible?

A. It is not designed to sterilize the air.

Q. Okay. And is it fair to say that the HVAC system in an operating room can greatly reduce the number of particles in the air but probably can't eliminate them all together?

MS. ZIMMERMAN: Object to form.

THE WITNESS: I believe that that's true, yes.

BY MR. GOSS:

Q. Okay. What types of particles are typically found in an operating room, in airborne air?

MS. ZIMMERMAN: Object to form.

Foundation.

BY MR. GOSS:

Q. I guess that's redundant, airborne

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air. In air in an operating room --

MS. ZIMMERMAN: Objection.

BY MR. GOSS:

Q. If you know.

A. I know only what I've read.

Q. Okay. And based on what you've read, can you describe the types of particles that will be in operating room air?

A. My understanding is that they would be primarily skin particles, squames. There might be staphylococcus, and a few of the other common --

Q. Okay.

A. -- microorganisms.

Q. Is there atmospheric dust in an operating room?

A. Atmospheric dust, I'm sure there is some dust that gets through. These are not 100 percent filters.

Q. Okay. So the operating room will have particles in the air that some -- some will be microbes; correct?

MS. ZIMMERMAN: Object to form.
Foundation.

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1 KOENIGSHOFER
 2 BY MR. GOSS:
 3 Q. If you know.
 4 A. Will some be microbes?
 5 Q. Yes, sir.
 6 A. That would be my guess.
 7 Q. Okay. And some will not be microbes;
 8 correct?
 9 A. Yes, sir.
 10 Q. Do you have any knowledge of the
 11 percentage of particles that will be carrying
 12 viable microorganisms in operating room air?
 13 A. I don't. If I did, I could get a
 14 Ph.D.
 15 Q. Does a particle have to be a certain
 16 size before it will carry bacteria?
 17 MS. ZIMMERMAN: Object to form.
 18 Foundation.
 19 THE WITNESS: Yeah. I don't know.
 20 BY MR. GOSS:
 21 Q. Do you know the size of a -- a size
 22 range of skin squames or squames, as you
 23 mentioned earlier?
 24 A. I believe they're around 10 microns?
 25 Q. Do you know whether bacteria can

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1 KOENIGSHOFER
 2 travel in air other than attached to a skin
 3 squame?
 4 MS. ZIMMERMAN: Object to form.
 5 Foundation.
 6 That's not what this witness has been
 7 offered to testify.
 8 THE WITNESS: I've read both sides of
 9 the article on that.
 10 BY MR. GOSS:
 11 Q. Okay. So do you -- but do you
 12 personally have any knowledge either way of
 13 whether bacteria travel in air alone or on a
 14 vehicle?
 15 MS. ZIMMERMAN: Object to form.
 16 Foundation.
 17 THE WITNESS: I would guess it's
 18 both.
 19 BY MR. GOSS:
 20 Q. Do you know whether they travel as
 21 single organisms or in clusters?
 22 MS. ZIMMERMAN: Object to form.
 23 Foundation.
 24 He's testified he's not a
 25 microbiologist and isn't going to be

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1 KOENIGSHOFER
 2 offered to testify about that.
 3 MR. GOSS: I haven't seen a
 4 microbiologist on the list yet. But -- I
 5 understand.
 6 BY MR. GOSS:
 7 Q. You can just say you don't know.
 8 That's --
 9 A. I don't know.
 10 Q. And I will move on.
 11 A. I am not a microbiologist.
 12 Q. Are you familiar with -- we've been
 13 talking about the Bair Hugger. Obviously it
 14 has a fan and it blows air. Are there other
 15 pieces of equipment in the operating room that
 16 you know of that blow air?
 17 A. Well, I believe, the anesthesia cart
 18 blows air. And in a cardiology area you would
 19 have a pulmonary pump. And of course there's
 20 monitors that -- I suppose that might blow air.
 21 Q. Anything else that you can think of
 22 that would have a fan, a cooling fan in it?
 23 A. No.
 24 Q. Do any of the things we just
 25 mentioned: Monitors, anesthesia machine, the

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1 KOENIGSHOFER
 2 pump, do any of those things incorporate a
 3 filter, to your knowledge?
 4 A. I don't know.
 5 Q. Is there any piece of OR equipment
 6 that you can think of right now that filters
 7 air, other than the Bair Hugger and the HVAC
 8 system?
 9 A. None that I know of.
 10 Q. So the Bair Hugger is a warming
 11 system, introduces heat into the operating room
 12 as we discussed; correct?
 13 A. Yes.
 14 Q. Are there other pieces of equipment
 15 in the operating room that generate heat and
 16 add to the cooling load for the operating room?
 17 MS. ZIMMERMAN: Object to foundation.
 18 THE WITNESS: Well, anything that's
 19 plugged in is going to generate heat.
 20 BY MR. GOSS:
 21 Q. Okay. So what are -- what are some
 22 of the things? Lights is an example. Do those
 23 generate heat?
 24 A. Yes.
 25 Q. Can you estimate the typical wattage

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1 KOENIGSHOFER
2 of an OR lighting system?
3 A. Might be 500 watts a piece, 3- -- 3-
4 to 500 a piece. Depends if they're LED or not.
5 Q. Okay. So LEDs will be cooler;
6 correct?
7 A. Yes.
8 Q. How many lights are -- in the
9 operating rooms that you designed, how many
10 lights are typically in there?
11 A. Two to five.
12 Q. Have you ever -- have you ever
13 actually been present to observe an orthopedic
14 surgery?
15 A. No. I've been on the other end.
16 Q. Okay. But you were asleep at the
17 time, I hope?
18 A. Yes.
19 Q. Okay. Do you know whether orthopedic
20 surgeons sometimes use head lamps that can
21 generate heat?
22 A. I don't know that. It wouldn't
23 surprise me, but I don't know it.
24 Q. Orthopedic surgeons use drills and
25 saws when they're doing joint replacements;

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1 KOENIGSHOFER
2 close a wound; correct?
3 A. That's my vague understanding, yes.
4 Q. Fair to say you don't know how much
5 heat that that generates?
6 A. Not off the top of my head. I could
7 research it quickly.
8 Q. When you're calculating the overall
9 cooling load for an operating room, what
10 equipment do you typically include in that
11 calculation?
12 A. Well, the people, the lights, the
13 equipment and you never know what equipment
14 they're going to have so you just estimate it.
15 Q. Okay. Do you typically estimate
16 the load from equipment in about 1 kilowatt?
17 A. Yeah. About that.
18 Q. How much heat do the people in the OR
19 generate?
20 A. Depending upon how busy they are,
21 around 400 BTUs per person per hour.
22 Q. So we've talked about a lot of
23 different equipment in addition to the Bair
24 Hugger. All these things generate air movement
25 and heat; correct?

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1 KOENIGSHOFER
2 correct?
3 A. Uh-huh.
4 Q. Do you know how much heat those
5 generate?
6 A. Well, my understanding is that
7 they're battery powered, so the majority of the
8 heat would be back off the table where it's
9 actually charging.
10 Q. Okay.
11 A. So the -- probably the device while
12 it's rotating, probably really doesn't generate
13 very much heat.
14 Q. Okay. Have you ever heard an
15 orthopedic surgeon say that the blade from a
16 saw was hot to the touch after making a cut?
17 A. I've never heard an orthopedic
18 surgeon say that.
19 Q. Okay. Would it -- I assume it
20 wouldn't surprise you that --
21 A. It would not surprise me.
22 Q. Okay. Are you familiar with
23 electrocautery?
24 A. In a very general manner.
25 Q. It's a device that uses heat to help

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1 KOENIGSHOFER
2 MS. ZIMMERMAN: Object to form.
3 THE WITNESS: Yes.
4 BY MR. GOSS:
5 Q. And --
6 A. If they're plugged in.
7 Q. If they're plugged in. Okay.
8 So I'm assuming that things are in
9 use in an operating room, and all of those
10 things have the potential to disrupt the gentle
11 waterfall of airflow from the ceiling
12 diffusers; correct?
13 A. It would depend on their proximity.
14 Q. If they're being used under the
15 diffusers during a surgical operation, they
16 would have the potential to effect that flow of
17 water -- of air?
18 A. Yes.
19 Q. I took the waterfall metaphor a
20 little too far. It's air.
21 Have you ever done any research on
22 air contamination caused by electrocautery
23 smoke?
24 A. I'm familiar with a German guy that
25 comes to our meetings and works for the Weiss

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company. And I have watched his dog and pony a few times and is kind of focused on the heat and particles coming from a electrocautery procedure.

Q. Okay. Is that something you've ever taken into account in any of the work that you've done with hospitals?

A. No. Again, I -- I pretty much accept the 170.

Q. Okay. So having seen your colleague's or acquaintance's presentation, do you have any reason to disagree that electrocautery can cause contamination in OR air?

MS. ZIMMERMAN: Object to form. Foundation.

THE WITNESS: Yeah. I -- I don't know enough to know about -- his was a theoretical -- it was a CFD model.

BY MR. GOSS:

Q. Same question for debris from the use of saws and drills in orthopedic surgery.

Have you done any research into --

A. No. I've never even thought about

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it.

Q. Okay. So just to finish my question. You haven't done any research into airborne contamination resulting from the use of drills and saws in orthopedic surgery?

A. Correct.

Q. Going back to page 3 of your report that you have in front of you. You indicate that you were asked to explain the environment of use, including how an operating room ventilation system is designed to minimize the risk of particles and infection.

I want to ask you about the "particles and infection." Is there a risk to particles other than infection? In other words, is the particle an independent risk of the infection risk?

MS. ZIMMERMAN: Object to the form of the question.

BY MR. GOSS:

Q. I'm just trying to understand what the "and" means. Is particles and infection the same risk or are they two different risks?

A. I believe that some particles can

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cause infection. There are probably, for some people, inorganic particles that might -- you know, a piece of silica --

Q. Right.

A. -- in an eye surgery would be a real bad thing.

Q. Okay. So when you're designing an HVAC system for an OR, you're concerned with reducing both the number of particles and the risk of infection; is that right?

A. Yes.

Q. Further down on page 3 you say, "Standard 170 is a design guide. It does little to address day-to-day operations, maintenance and activities of medical staff within the rooms."

THE REPORTER: Within the? I didn't hear.

MR. GOSS: Rooms.

BY MR. GOSS:

Q. Did I read that correctly?

A. Yes, sir.

Q. All right. So is it fair to say that you don't have expertise in the day-to-day

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operations, maintenance and activities of medical staff within the rooms?

MS. ZIMMERMAN: Object to form.

THE WITNESS: That is an accurate statement.

BY MR. GOSS:

Q. All right. And you're not planning to offer any opinions with respect to the day-to-day operations, maintenance and activities of medical staff within ORs; correct?

MS. ZIMMERMAN: Object to form.

THE WITNESS: Can you ask me again?

BY MR. GOSS:

Q. Sure. We established that you're not an expert in the day-to-day activities of medical staff as far as maintenance and activities and day-to-day operations; right?

MS. ZIMMERMAN: Object to form.

Misstates the witness' testimony.

BY MR. GOSS:

Q. If you are an expert, just tell me.

A. Oh, no, I'm not an expert on clinical operations.

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Q. And so you're not intending to offer any opinions regarding clinical operations; correct?

A. Correct.

Q. And that would include things like -- or would it include things like cleaning practices at a given hospital?

A. That's correct.

Q. On page 3 you say, "Air quality is generally defined by particle count, both organic and inorganic."

Have you ever done a particle count in an operating room?

A. No.

Q. What is your -- do you have a resource or a piece of literature that you cite to for this statement, "Air quality is generally defined by particle count"?

A. Well, the Clean Air Act of 1970 was --

Q. Okay.

A. Utilizes.

Q. Anything more specific with respect to operating rooms?

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A. There's a lot of discussion about it at the various ASHRAE meetings. I don't -- I can't give you a specific reference.

Q. Okay.

A. Just to me it's kind of common sense.

Q. Well, but you're offering expert opinions and not common sense opinions in this case; correct?

A. I don't know there's a distinction between those two.

Q. All right. On page 5 there's a discussion of ASHRAE Standard 170. And just below that, a second sentence of the bottom paragraph, they say, "Asepsis is the state of being free of pathogenic microorganisms or the processes for removing pathogenic organisms."

And you have quote marks around -- around part of that. Where is that quote from?

A. Wikipedia.

Q. Okay.

A. Either that or I looked it up. I've got a dictionary app on my phone.

Q. Okay. Do you have an expert understanding of the difference between asepsis

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and sterility?

A. I do not.

Q. On page 6 you have a figure, figure 2, with a discussion of key elements of S170.

You see that?

A. Yes.

Q. All right. And it looks like this is from a PowerPoint slide; is that right?

A. Yes.

Q. Is this from a presentation?

A. Yes.

Q. Is it a presentation that you wrote?

A. Yes.

Q. Was this a presentation for an ASHRAE meeting or an ASHRAE course?

A. Yes.

Q. Under the "key elements" of S170, first one is "ACH rate." We discussed that a little bit. The ACH rate specified by 170 is 20 air changes per hour; is that right?

A. Correct.

Q. Is that a debated issue within the 170 Committee?

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A. Yes. Well, it has been brought to 170 as a proposed change, to lower it.

Q. To lower it. Okay.

And what's the argument for lowering the ACH rate?

A. Same energy.

Q. Second bullet is "ACH filtered or recirc without filtration."

What is that referring to?

A. Standard 170 allows air to be recirculated within certain rooms, like patient rooms.

Q. Okay.

A. When air is recirculated within a patient room it's not refiltered.

Q. Does this discussion apply to operating rooms?

A. No.

Q. Because recirculated air within an operating room --

A. That's not allowed.

THE REPORTER: I didn't get --

THE WITNESS: Well, it's not allowed to recirculate, I'm sorry.

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THE REPORTER: I didn't get the end of your question.

MR. GOSS: Is filtered.

BY MR. GOSS:

Q. So let me ask a different question.

The standard is 20 air changes per hour, and four of those have to come from outdoor air; is that right?

A. Yes.

Q. Okay. So --

A. Let me make sure you said that correctly. 20 air changes total, four of which must be outside air.

Q. Yes, sir.

So the remaining 16 air changes per hour are recirculating the air that's in the room; correct?

A. They're recirculating it through the air handler and through the filters.

Q. Yes, sir.

A. Yes.

Q. In other words, the 20 air changes per hour aren't all coming from outside?

A. That's correct.

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Q. Four of them are?

A. Yes.

Q. So this second bullet really does not apply to operating rooms; is that right? Is this...

A. That's right.

Q. Third bullet is "diffuser velocity in OR."

We spoke earlier, does that refer to the 25- to 35 feet per minute?

A. Yes.

Q. Is there a debate over that requirement?

A. Yes.

Q. And what's the nature of that debate?

A. Well, a certain extent boils down to the theory of the wound plume.

Q. Okay.

A. And A) is there really a wound plume; B, does 35 really protect it or not?

Q. So are there -- are there arguments for increasing the diffuser velocity above 35?

A. Well, it would be advantageous in that the diffuser array itself could be smaller

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and/or more of it could be obscured by lights and booms and all the other stuff the OR people want to put in. Because it's hard to -- to design a diffuser array that gets the 20 air changes. It gets big. It can be smaller.

If the velocity was higher, the diffuser rate could be smaller and that would, of course, save money.

Q. The second to the last bullet says "scientific evidence is needed, especially dose response."

What is that referring to?

A. Well, it refers to almost everything, you know. I mean, people come to us and say, why not 19 air changes? Why not 18? And the data doesn't exist to answer that question in the scientific manner.

Q. So the recommendations, standard 170 -- I guess let me ask it this way.

Is there scientific data to support all the recommendations that are in standard 170?

MS. ZIMMERMAN: Object to form.

THE WITNESS: There are people who

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would say yes and there are people who would say no.

BY MR. GOSS:

Q. Where do you fall?

A. Well, I would fall on the side of some of it yes and some of it no.

Q. Right below that you start a section on "infection control." And second -- sorry, third sentence is something we already talked about, "While there are many sources of microorganisms, most experts agree that airborne sources of infection are responsible to 5 to 15 percent of HAI." Correct?

A. Yes.

Q. And then you say, "These airborne infections are estimated to cost in excess of 500 million per year -- each year." Correct?

A. Yes.

Q. In that 500 million figure, are you including things like respiratory airborne infections or are you limiting it to surgical site infections or do you know?

A. I am including respiratory.

Q. So things like --

1 KOENIGSHOFER
 2 A. Airborne.
 3 Q. -- tuberculosis, pneumonia?
 4 A. Yes. If it's airborne in the CDC
 5 definition.
 6 Q. Okay. For the 85 to 95 percent of
 7 HAI that are not from airborne sources, do you
 8 have any understanding where those
 9 infections -- what causes those infections?
 10 MS. ZIMMERMAN: Object to form.
 11 Foundation.
 12 THE WITNESS: Well, you know -- yeah.
 13 I'm not an expert on it, but I understand
 14 it might be from the instruments or from
 15 hands or other contact touching surfaces.
 16 BY MR. GOSS:
 17 Q. Can the patient him or herself, can a
 18 patient's own skin be a source of infection in
 19 a surgery, to your knowledge?
 20 A. I -- I don't know the answer to that
 21 question.
 22 MS. ZIMMERMAN: We've been going
 23 again for about an hour and 20 minutes.
 24 Should we --
 25 MR. GOSS: Yeah, we'll take a break.

1 KOENIGSHOFER
 2 Q. And does the site have a multiplier
 3 effect on the probability of infections? I'm
 4 just wondering why it's even "dose times site
 5 times virulence."
 6 A. I did not invent this equation, but I
 7 would say that certainly some sites are much
 8 worse than others.
 9 Q. Do you remember where you took this
 10 equation from?
 11 A. It's a bit of a simplification of the
 12 Wells-Riley equation. It's not a bit. It's
 13 quite simplified. And someone else made that
 14 simplification. And no, I don't remember from
 15 whom I stole that.
 16 Q. Section 4 or number 4 right below
 17 that is a dose. It says, "Generally, bacteria
 18 and viruses ride on larger particles and
 19 parasols."
 20 With surgical site infections, are we
 21 concerned at all with viruses or is it just
 22 bacteria?
 23 MS. ZIMMERMAN: Object to the form of
 24 the question.
 25

1 KOENIGSHOFER
 2 THE VIDEOGRAPHER: Off the record at
 3 2:58 p.m.
 4 (Thereupon, a brief recess was taken.)
 5 THE VIDEOGRAPHER: Back on record at
 6 3:12 p.m.
 7 BY MR. GOSS:
 8 Q. All right. Coming back to your
 9 report. You have -- on page 7 there's a figure
 10 3, the infection equation. And it says,
 11 "Infection equals dose times site times
 12 virulence times time, divided by level of host
 13 defense."
 14 And my question for you is, what is
 15 the site that's included in this equation?
 16 What's that referring to?
 17 A. Well, it's the site of the patient,
 18 where is the bug chewing on you?
 19 Q. Okay.
 20 A. Is it chewing on your arm, or chewing
 21 on your eye or chewing on your heart?
 22 Q. Okay. So it's the site of the
 23 infection?
 24 A. Well, the equation is for the
 25 probability of getting an infection.

1 KOENIGSHOFER
 2 BY MR. GOSS:
 3 Q. If you know.
 4 MS. ZIMMERMAN: Foundation.
 5 THE WITNESS: I don't know.
 6 BY MR. GOSS:
 7 Q. Then there's a sentence that goes
 8 from 7 to 8. It says, "At this time there is
 9 no single accepted method to measure pathogenic
 10 microorganisms in the air in real-time."
 11 When you say there is "no single
 12 accepted method," are you saying that there are
 13 a variety of methods, or are you saying that
 14 there is no method?
 15 A. I have read articles by people who
 16 say that they've invented devices that could do
 17 this.
 18 Q. Okay.
 19 A. My feeling is that if it were broadly
 20 accepted that a certainly methodology worked,
 21 we would be using it.
 22 Q. Have you ever heard of fluorescence
 23 aerosol particle sensor technology?
 24 A. Yeah. Only in one of the things that
 25 I've read. I think maybe one of your...

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Q. In Dr. Ho's report?

A. Maybe that's where it was.

Q. Had you heard of that system ever before seeing Dr. Ho's report?

A. Basically, no.

Q. Have you ever attempted to culture microbes from air in an operating room?

A. Not from air in an operating room.

Q. Have you attempted to culture microbes from air somewhere else?

A. Sure. Science experiments.

Q. When was that?

A. Oh, I've done it with my kids.

Q. Okay. So is this something kind of like -- my grandfather would make his own starter for sourdough by capturing yeast in the air.

Is that the kind of thing we're talking about?

A. Yeah. Sort of like getting an agar plate and set it out in the house and --

Q. Okay.

A. -- see what it looks like in three days.

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Q. But in terms of your work as an HVAC engineer, you -- have you ever had occasion to use agar settle plates in an operating room? It's agar, a-g-a-r. In an operating room.

MR. GOSS: Did you get his answer?

THE REPORTER: No.

MS. ZIMMERMAN: We have to close the door.

(Question was read back.)

THE WITNESS: No.

BY MR. GOSS:

Q. And then you go on to say that, "It is generally understood and accepted that the best surrogate for air quality is to measure particles."

Is there any particular literature you rely on in making that statement?

A. Well, again, Ambient Air Quality Standards.

Q. Have you seen literature in your work on this case that did not find a correlation between particle count in an operating room and actual microbial bioburden?

MS. ZIMMERMAN: Object to form.

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And he's not asking you to guess, so if you need to refer to one of your articles, you're welcome to.

THE WITNESS: Well, my answer is, I saw -- I have read that.

BY MR. GOSS:

Q. Okay.

A. In one of those articles, yes.

(Thereupon, Exhibit 16 was marked for identification.)

BY MR. GOSS:

Q. Okay. Exhibit 16 is an article by Landrin or Landrin entitled Monitoring Air Sampling in Operating Theatres. Can Particle Counting Replace Microbiological Sampling?

Is this an article that you reviewed for your work on this case?

A. No.

Q. Just looking at the summary, it says, "The microbiological contamination of air in the operating room is generally considered to be a risk factor for surgical site infections in clean surgery. Evaluation of the quality of air in operating theatres can be performed

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routinely by microbiological sampling and particle counting, but the relationship between these two methods has rarely been evaluated."

The aim of this study was to determine whether particle counting could be predicted of microbiological contamination of air in operating rooms; correct?

A. That's what it says.

Q. And when a hospital does a particle count in an operating room, isn't it infection risk that they're really concerned about?

MS. ZIMMERMAN: Objection to form. Foundation.

BY MR. GOSS:

Q. If you know.

A. That would be my assumption, yes.

Q. And so what this study was investigating was whether you could do a particle count as you said, as a surrogate for microbes in an operating room.

And what they found, if you just go to the end of the summary, is that no particle count value could be predictive of a microbiological count higher than 5 CFU per

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1 KOENIGSHOFER
2 cubic meter; correct?
3 MS. ZIMMERMAN: Object to form.
4 MR. GOSS: Did I misread it?
5 MS. ZIMMERMAN: No. I think that you
6 read that fraction of the sentence
7 correctly, but this -- this article hasn't
8 been provided to the witness prior to now.
9 So to the extent that you're asking him
10 questions about the conclusions, I'd
11 request at a minimum he have an
12 opportunity to read the entire thing.

13 MR. GOSS: Sure.

14 BY MR. GOSS:

15 Q. You're welcome to look it over. I'm
16 just -- I'm just reading you what they
17 concluded. I understand that you haven't seen
18 this before.

19 At any rate, their conclusion is,
20 "The results of the current study suggest that
21 there is no reason to replace microbiological
22 sampling with particle counting for routine
23 evaluation of microbiological contamination in
24 conventionally ventilated operating theatres."

25 Did I read that correctly?

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1 KOENIGSHOFER

2 A. You did.

3 Q. Later on in this discussion of the
4 study, if you go to page 29, on the second
5 column towards the top, it's a few sentences
6 in. It says, "The cut-off value of 5 CFU per
7 cubic meter was specifically studied because it
8 has been defined as the threshold limit in
9 French guidelines."

10 Are you aware of any cut-off values
11 in the United States for CFUs per cubic meter
12 in an operating room?

13 A. I am not.

14 Q. Are you aware of a general target for
15 CFUs per cubic meter in operating rooms in the
16 U.S.?

17 A. No.

18 (Thereupon, Exhibit 17 was marked for
19 identification.)

20 BY MR. GOSS:

21 Q. All right. Exhibit 17 is an article
22 by Cristina and colleagues called, "Can
23 Particulate Air Sampling Predict Microbial Load
24 in Operating Theatres for Arthroplasty?"

25 Have you seen this article before?

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1 KOENIGSHOFER
2 A. No.
3 Q. If you like, I'll give you a little
4 time to look at it. I'm going to just ask you
5 some questions based on the summary.
6 MS. ZIMMERMAN: While the witness
7 reads that, I would just raise an
8 objection that to the extent that you're
9 asking for his opinions or understanding
10 of an article that he's just been provided
11 for the first time but, of course, he has
12 not relied upon.

13 And then it's looks like the second
14 article that's done internationally and
15 things. It looks like Italy in 2012
16 versus France in 2005. I mean, if your
17 questions are about standards and if
18 they're the same in Italy...

19 MR. GOSS: My questions are about his
20 statement that it is generally understood
21 and accepted that the best surrogate for
22 air quality is to measure particles. And
23 this relates to that issue.

24 BY MR. GOSS:

25 Q. All right. So in this study, have

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1 KOENIGSHOFER

2 you had a chance to read at least the abstract?

3 A. Well, no, I didn't finish the
4 abstract.

5 Q. Okay. Let me know when you've had a
6 chance to read it.

7 A. Okay.

8 Q. So this study, just reading what they
9 say here, "The aim of this study was to
10 determine whether particle counting could
11 predict microbiological contamination of the
12 air in an operating theatre during 95 surgical
13 arthroplasty procedures." Correct?

14 A. Uh-huh. Yes.

15 Q. All right. And they measured both
16 airborne particulate contamination, as well as
17 bacterial load in the center of the operating
18 theatre; correct?

19 A. I believe that's what it says. Yes.

20 Q. All right. They said that, "The mean
21 value of the total bacterial load in the center
22 of the operating theatre proved to be 35 CFUs
23 per cubic meter."

24 Do you have an understanding as to
25 whether 30 CFUs per cubic meter is high, low or

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otherwise for an operating room?

MS. ZIMMERMAN: Thirty-five?

MR. GOSS: Yes. 35 CFUs per cubic meter.

THE WITNESS: I've seen numbers in that order of magnitude in the literature.

BY MR. GOSS:

Q. All right. And a particle count was over 4 million particles per cubic meter for particles of diameter greater than .5 micrometers; correct? Or microns. Sorry. Microns.

A. Uh-huh.

Q. And 13,519 per cubic meter for particles greater than 5 microns; correct?

A. Right.

Q. Is that a typical distribution of particles of those sizes where you would have a significantly -- well, couple orders of magnitude more particles of the size below .5 microns than the particles above .5 microns?

MS. ZIMMERMAN: Object to form. Foundation.

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BY MR. GOSS:

Q. If you know.

A. I would expect there to be more particles, smaller particles by count.

Q. So this study found a statistically higher concentration of particles during hip replacement procedures; correct? Based on the abstract.

A. Higher concentrations during knee replacement procedures.

Q. Oh, I'm sorry.

A. Which part are you reading here?

Q. Yeah, I skipped ahead of you.

So it says there was a "statistically higher concentration of particles greater than .5 microns during knee replacement procedures."

A. Uh-huh. Yeah.

Q. "By contrast, particles greater than 5 microns were higher in the hip procedures." Correct?

A. That's what it says.

Q. And then it says, "The results did not reveal any statistically significant correlation between microbial loads and

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particle counts for either of the particle diameters considered. Consequently, microbiological monitoring remains the most suitable method of evaluating the quality of air in operating theatres."

Do you have any basis to disagree with the author's conclusion?

A. Well, the problem with biological sampling is it will take you two or three days to get the results.

Q. Okay.

A. By that time you've done three more surgeries on three different kinds of people and things change. So that's the great shortcoming of not being able to measure viable particles in the air in real-time.

That's why in my statement I said "in real-time."

Q. Have you evaluated any of the systems that can be used to detect particles, biological active particles in real-time?

A. I have not.

Q. And if you're going to rely on particle count alone, is there a risk that you

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could get a false positive?

A. Well, I would say that you can't have a colony-forming unit without having a particle. If you have zero particles, you would have zero colony-forming units.

Q. Sure. So if the particle count is low, you can have some confidence that you don't have airborne -- significant airborne bioburden; correct?

MS. ZIMMERMAN: Objection to form. Misstates the witness' testimony.

THE WITNESS: I think you would have some. Significant, I don't know. Depends upon your definition of "significant." It would be not -- it would not be zero.

BY MR. GOSS:

Q. But again, if the particle count is low, I want to understand what you're saying, you can have some comfort that you're not -- you don't have significantly -- or you don't have contaminated air as a problem; is that fair?

MS. ZIMMERMAN: Objection to the form of the question.

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1 KOENIGSHOFER
 2 THE WITNESS: I wouldn't say that.
 3 BY MR. GOSS:
 4 Q. All right. How would you say it?
 5 A. If the number of particles is low,
 6 the probability is that the number of
 7 colony-forming units is also low.
 8 Q. And now, are you saying conversely,
 9 that if the particle count is high that there
 10 is a correlation of some sort to airborne
 11 bioburden?
 12 A. I believe there is, yes.
 13 MS. ZIMMERMAN: Objection.
 14 Q. How would you show that
 15 scientifically?
 16 A. Some correlation.
 17 Q. Okay.
 18 A. Well, I mean, the efforts that these
 19 different people are making. I mean, they
 20 didn't say there was no correlation.
 21 Q. No statistically significant
 22 correlation; correct?
 23 A. Within the size ranges that they're
 24 discussing.
 25 MS. ZIMMERMAN: Object to form.

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1 KOENIGSHOFER
 2 A. I think that some number of particles
 3 in the air are going to have bacteria on them.
 4 Q. No dispute there.
 5 But the correlation between the
 6 number of particles and the number of bacteria,
 7 what do you rely on in terms of your role as an
 8 expert witness in this case to make that
 9 correlation?
 10 A. For example, in the standard USP 797,
 11 they talk about CFUs per particles.
 12 Q. Okay. And that's US Pharmacopeia?
 13 A. Yes.
 14 Q. For a pharmacy?
 15 A. Yes.
 16 Q. Are you aware --
 17 A. I've seen other articles on it.
 18 Again, I can find it here. I think I have one
 19 here.
 20 Q. But as of right now, you can't point
 21 me to anything that correlates particles to
 22 bioburden in an operating room?
 23 MS. ZIMMERMAN: Objection to form.
 24 Misstates his testimony.
 25

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1 KOENIGSHOFER
 2 BY MR. GOSS:
 3 Q. Well, the results did not reveal any
 4 statistically significant correlation between
 5 microbial loads and particle counts for either
 6 of the particle diameters considered; correct?
 7 A. That's what it says, yes.
 8 Q. All right. And the Landrin article
 9 also found that no particle count value could
 10 be predictive of a microbial count higher than
 11 5 CFUs per metered cube; correct?
 12 A. Predictive. In other words, you
 13 would have trouble drawing a -- a line on a
 14 graph.
 15 Q. What --
 16 A. Does more equal more? He didn't
 17 exclude that as a possibility.
 18 Q. As a possibility, but what would you
 19 rely on to make a correlation? What research
 20 or article would you rely on to make
 21 a correlation that particle count is an
 22 appropriate surrogate for bioburden?
 23 A. Well, first of all, I'd rely on
 24 common sense.
 25 Q. Okay.

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1 KOENIGSHOFER
 2 BY MR. GOSS:
 3 Q. Is that fair?
 4 MR. GOSS: I'm not asking his
 5 testimony. I'm asking him a question.
 6 BY MR. GOSS:
 7 Q. Can you tell me right now of any
 8 study that correlates airborne particles to
 9 actual bioburden in an operating room?
 10 MS. ZIMMERMAN: Well, respectfully,
 11 counsel, he's not required to have every
 12 study memorized that he's looked at.
 13 MR. GOSS: I understand that. I'm
 14 just asking him if he knows it or he
 15 doesn't.
 16 BY MR. GOSS:
 17 Q. I'm not saying no such studies exist.
 18 A. I believe that I have seen such
 19 statement in some of these studies that are in
 20 this binder right here.
 21 Q. Would it be fair to say that the
 22 literature regarding the correlation between
 23 particle counts and airborne bioburden is mixed
 24 in terms of some find correlation and some
 25 don't?

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A. Yes.

Q. Are you familiar with any research finding that once particle levels had been sufficiently reduced, that airborne sources of contamination contribute less to the risk of surgical site infection? Have you seen articles about that?

A. Even -- even without her help, I got to ask for that question again.

Q. Understood.

All right. So my question is -- again, thinking about it, just big picture. You reduce the number of particles and presumably CFUs in an operating room. Is it fair to say that beyond a certain level, once you've reduced the counts to a certain level, the airborne contribution to the risk of surgical site infections is going to be less significant than other factors that contribute to surgical site infections?

That was a longer question, but do you understand what I'm saying?

MS. ZIMMERMAN: Object to form. Foundation.

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THE WITNESS: Can you ask them in two -- two simpler questions?

BY MR. GOSS:

Q. Sure. Sure. Sure. Maybe I'll just show you what I'm talking about and see if it makes any sense.

(Thereupon, Exhibit 18 was marked for identification.)

BY MR. GOSS:

Q. All right. 18 is a paper by Der Tavitian and colleagues called Body-exhaust Suit Versus Occlusive Clothing: A Randomized prospective Trial Using Air and Wound Bacterial Counts.

Have you seen this paper before?

A. No.

Q. I'll give you a chance to read the summary. Let me know when you're ready.

A. Okay.

Q. So this study was attempting to compare two different types of clothing that the surgical team might wear in an operating procedure; correct?

A. Uh-huh.

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Q. For a knee replacement?

A. Right.

Q. Okay. There's -- the body-exhaust suits is one example. Do you have any experience with body-exhaust suits?

A. No.

Q. The other --

A. I've seen them, but...

Q. Okay. And the other option was something called Rotecno occlusive clothing. And they compared the bacteria found in the surgical wounds to the bacteria found in the air; correct?

A. That appears to be correct. Yes.

Q. And the CFU counts they found in the OR air with the body-exhaust suits was .5 CFUs per cubic meter and then 1 CFU per cubic meter with this Rotecno; correct?

A. Uh-huh.

Q. And do those levels of CFUs sound consistent with other literature you've seen?

A. They seem a little low.

Q. Okay.

A. I've seen 10, 20 up to 50.

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Q. Okay. It goes on to say, "The higher" -- oh, I'm sorry. It says, "There were -- was no correlation between the air and wound counts;" correct?

A. Yes. That's what it says.

Q. And then it says, "The higher air counts suggest that Rotecno occlusive clothing is less effective than body-exhaust suits. But wounds were equally contaminated with both types of clothing suggesting that at very low levels of air contamination, the contribution of bacteria to the wound from the air is irrelevant."

Do you see --

A. Yes, I see that.

Q. All right. In your ASHRAE discussions, whether it's Standard 170 Committee or anywhere else, have you talked about the concept of diminishing marginal returns in terms of infection reduction by filtering air?

A. Sure.

Q. And would you agree with what these authors are suggesting, which is, if you

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control the CFUs in the air as well as they did in this case, the contribution to infection risk from the air becomes less important?

A. Sure. It's sort of, again, I'm going to apply common sense, if that's acceptable. There's less in the air, there's less in the wound.

Q. And that -- when that's the case, you need to focus on other potential sources of bacteria or other pathways for bacteria to get to the wound; correct?

A. Probably at all times you need to focus on all opportunities for infection.

Q. Coming back to your report on page 9, figure 5 is a graphic with a title. It says Small Particles Don't Settle; correct?

A. Yes.

Q. But a point above that, you say, "Particles the size of skin squames" -- or squames, I never know which it is -- "which are 10 microns, will settle in minutes;" correct?

A. Yes.

Q. As distinct from small particles that will stay in suspension for hours; correct?

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A. Yes.

Q. And so according to this figure, a 10 micron particle should settle out in 8.2 minutes; correct?

A. In perfectly still air --

Q. Okay.

A. -- absent other mechanisms and turbulence.

Q. So how long will turbulence cause that particle to stay in the air?

MS. ZIMMERMAN: Object to the form. Foundation.

BY MR. GOSS:

Q. If you know.

A. It would be -- depend on how turbulent the turbulence is. There's no -- turbulence is not a point in space.

Q. Can turbulence defeat the effect of gravity on a 10-micron particle?

MS. ZIMMERMAN: Object to form. Foundation.

THE WITNESS: I would think so, yes.

BY MR. GOSS:

Q. So is it your testimony that a

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10-micron particle can stay suspended in air indefinitely?

A. Just as a hand glider could probably stay up forever in certain situations, so could a 10-micron particle.

Q. Okay.

A. Given sufficient convective motion in turbulence.

Q. Have you done any research in this case on a settling time that it -- for 10-micron particles in an operating room?

A. I have not. This, I believe, comes from CDC. I think they're pretty authoritative.

Q. All right. At any rate, what you have in your report, you say that the particles that size will settle in minutes, 10-micron particles will settle in minutes; correct?

A. Yes. You might go on to read the next sentence, however.

Q. Sure. "Thus, it is reasonable to conclude that squames shed during surgery would drop to and stay on the floor absent other mechanisms and turbulence;" correct?

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A. Yes.

Q. What are the "other mechanisms" you're referring to there?

A. Oh, gosh, I don't know. You might have a fan. You might have doors opening, people running around.

Q. Okay. So when you talk about "people running around," I mean, if 10-micron particles are on the floor, will foot traffic stir them up?

MS. ZIMMERMAN: Object to form. Foundation.

BY MR. GOSS:

Q. If you know.

A. I don't know, but I would speculate yes.

Q. Okay. So the mechanical force of your foot moving on the floor would be enough to dislodge some 10-micron particles; correct?

MS. ZIMMERMAN: Object to form. Foundation.

THE WITNESS: I would think so, yes.

BY MR. GOSS:

Q. Okay. How many people are typically

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present in an operating room during a hip or knee arthroplasty; do you know?

A. Four, six.

Q. Okay.

A. Something in the order of magnitude.

Q. Isn't that -- and that's the figure you used to calculate the cooling load, correct, was four to six?

A. I'd have to look back at it, but probably.

Q. Have you ever -- you've never observed an orthopedic surgery, but do you have any understanding of how much the surgical team moves around the room during the surgery? Is that something you know anything about?

A. I don't. Other than, you know, the assumptions that people have made for their CFDs, such as Elgohbashi's statements and how he has robots moving about.

Q. Now, does he have people actually moving in his CFD?

MS. ZIMMERMAN: Object to form. Foundation.

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BY MR. GOSS:

Q. Well, you reviewed his report; correct?

A. I did review his report and --

Q. Is it your understanding that the surgical team was actually moving during that?

A. Well, that's all -- that's all model anyway. There's -- nobody's really doing anything. It's a CFD.

Q. Right. Everything is -- essentially it's --

A. Yeah. I -- honestly, I don't remember if he moves his objects around.

Q. Okay.

A. I may be confusing it with Gormley.

Q. Gormley -- is that some -- another CFD researcher?

A. No. It's a real researcher. But he had -- he did a faux operation where he had people choreographed to walk around at certain times --

Q. Okay.

A. -- and do certain things.

Q. Did he publish a paper on that?

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A. Yes.

Q. Do you remember offhand the year?

A. You'll have it in your stuff there.

Q. Oh, it's in there? Okay.

A. Yes. It's recent.

Q. And just to finish on this point, you have not done a calculation of the level of turbulence required to sustain -- to keep a 10-micron particle suspended in air; correct?

A. Correct.

Q. All right. Turning to page 10, where there's a discussion of filtration in a paragraph near the bottom of the page.

Do you see that?

A. Uh-huh.

Q. All right. And there's a table with minimum filter efficiencies. And you go on to say that, "MERV is a measure of filter efficiency with a scale of 1 to 20;" correct?

A. Yes.

Q. Does ASHRAE Standard 522 -- 52.2, does that actually enable someone to calculate a MERV above 16, do you know?

A. I don't know. I have been told by my

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Camfil guy that -- that they don't make a -- anything called a MERV 17.

Q. Okay. That was my next question, with "MERV 17 is commonly used in hospitals and often referred to as HEPA."

In a current standard of 52.2, which we previously marked is Exhibit 14, there's nothing in the current standard above MERV 16; correct?

A. That's probably true. The one that's in my report I see is from 2007.

Q. Okay.

A. So that was clearly a change in this standard.

Q. Do you have any knowledge or insight into why the 52.2 committee removed MERV 17 through 20 from -- from the MERV table?

A. I do not.

Q. On page 11 you talk about the importance of making sure a filter has been installed correctly.

A. Yes.

Q. True?

Have you -- and I may have asked this

1 KOENIGSHOFER

2 earlier, if so I apologize.

3 Have you tested a Bair Hugger unit
4 for leaks around the filter?

5 A. No.

6 Q. Page 13. It discusses the role of
7 site in the infection equation. And the third
8 sentence is, "Deep wounds are generally
9 understood to be more susceptible than shallow
10 wounds."

11 What's that comment based on?

12 A. Oh, I guess it is based on, you know,
13 the reading that I've done. And again, common
14 sense and the fact that, I mean, I know of
15 people -- well, I've read of people who will
16 get wounds -- I mean, infections in hip and
17 knee replacements, and it lasts for years and
18 years and years.

19 Q. Yeah.

20 A. It's obviously very, very serious.

21 Q. Do you have any understanding of the
22 rate of superficial surgical site infections,
23 meaning around the skin and the incision?

24 A. You know, I don't know the breakdown
25 of those percentages of hospital-acquired

1 KOENIGSHOFER

2 infections. So when I say it's 5 to 15 -- if
3 you dug into the CDC data it may show you.
4 Whether some are shallow, some are deep, I
5 don't really know.

6 Q. So your statement here is based more
7 just on your experience?

8 A. Yes.

9 Q. The last sentence in that paragraph
10 you're talking about the space below the OR
11 diffusers. The area directly below the
12 diffuser is referred to as the sterile field;
13 correct?

14 A. It is referred to by us design
15 engineers as the sterile field, yes.

16 Q. I want to make sure I understand why
17 it's referred to as the sterile field. Is it a
18 sterile field because the air coming down is
19 sterile, or is it because the surgical site has
20 been prepared using cleansers and --

21 A. I'm speaking as a design engineer,
22 and it's the air coming down. Is it
23 100 percent sterile? No.

24 Q. And then you say, "Anything that
25 disrupts this waterfall of sterile air reduces

1 KOENIGSHOFER

2 its effectiveness. Disruptions, turbulence are
3 caused by surgeons and staff, objects, light
4 booms, tables, thermal plumes, markedly hot or
5 cold air, and air currents caused by devices,
6 personnel and doors;" correct?

7 A. Yes.

8 Q. And all of those things can be
9 present in an operating room with or without
10 the Bair Hugger; correct?

11 A. That's correct.

12 Q. Page 14 you talk about the element of
13 time in the infection equation.

14 A. Yes.

15 Q. And this is where you discuss the
16 20 ACH requirement from Standard 170. And you
17 say, "In most ORs this is a flow rate of 2000
18 to 3000 CFMs; correct?"

19 A. Yes.

20 Q. And I think you mentioned earlier
21 that some hospitals may want a flow rate that's
22 higher or lower than that; correct?

23 MS. ZIMMERMAN: Object to form.

24 BY MR. GOSS:

25 Q. Or is that true?

1 KOENIGSHOFER

2 A. Well, I have had clients who want
3 more and there are probably clients who want
4 less. But we never do less because that's what
5 the code is.

6 Q. So is it fair to say that 2000 to
7 3000 CFMs is fairly typical for operating rooms
8 in the U.S., based on your experience?

9 A. Yeah. I mean, it depends on the size
10 of the operating room -- the size of the
11 operating room, the volume.

12 BY MR. GOSS:

13 Q. Okay.

14 A. That's what you're doing. You're
15 changing out the volume of the operating room
16 20 times per hour. So flow rate in is
17 determined by what's the volume of the
18 operating room.

19 Q. And the flow rate out of the Bair
20 Hugger blankets, what is that figure?

21 A. About 50.

22 Q. About 50 for the 750, 775 and
23 something lower than that for the 505; correct?

24 A. That's correct.

25 Q. Page 15 you have the -- the top

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1 KOENIGSHOFER
 2 discusses "comfort." Would you agree that
 3 keeping patients comfortable postoperatively is
 4 an important -- is important?
 5 MS. ZIMMERMAN: Object to foundation.
 6 Form. Foundation.
 7 THE WITNESS: I certainly would think
 8 so. If I were a patient I would want to
 9 be comfortable.
 10 BY MR. GOSS:
 11 Q. Are you familiar with the shivering
 12 that patients can develop after coming out of
 13 general anesthesia?
 14 A. Yes.
 15 MS. ZIMMERMAN: Object to form.
 16 BY MR. GOSS:
 17 Q. And do you agree that there is some
 18 value for the patient in technology that helps
 19 alleviate that shivering?
 20 MS. ZIMMERMAN: Object to form.
 21 Foundation.
 22 THE WITNESS: Yeah. I -- I would
 23 think so.
 24 BY MR. GOSS:
 25 Q. Second paragraph of page 15, the last

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1 KOENIGSHOFER
 2 sentence you say, "Cold air can create problems
 3 as it accelerates after leaving the diffuser."
 4 Explain what you mean by that.
 5 A. Well, cold air is denser, it drops.
 6 Hot air is hotter, less dense, it rises. So...
 7 Q. Okay. So if the -- so if the air
 8 coming out of the diffuser is colder, is that
 9 going to go faster than 35 CFMs?
 10 A. That is my understanding.
 11 Q. And as you say here, this can disrupt
 12 the wound plume and increase turbulence;
 13 correct?
 14 A. Yes.
 15 MR. GOSS: How are we doing? Do you
 16 want to take another short break or do you
 17 want to keep going?
 18 MS. ZIMMERMAN: Sure.
 19 THE VIDEOGRAPHER: Off record at
 20 4:03.
 21 (Thereupon, a brief recess was taken.)
 22 THE VIDEOGRAPHER: Back on record at
 23 4:16 p.m.
 24 BY MR. GOSS:
 25 Q. All right. Page 16 of your report,

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1 KOENIGSHOFER
 2 section 4. You include a discussion of your
 3 brief literature review concerning Bair Hugger
 4 and air quality.
 5 How did you -- well, first, let me
 6 ask you this. I know that some materials were
 7 sent to you by counsel; correct?
 8 A. Correct.
 9 Q. Did you do any literature searches of
 10 your own, aside from what they sent you?
 11 A. I don't think that they sent me the
 12 Kowalski, the number two.
 13 Q. Okay. But did you do -- did you go
 14 to like Medline or some other aggregator to run
 15 keyword searches for literature?
 16 A. I have, yes. Elsevier, whatever it's
 17 called.
 18 Q. Okay. Do you remember what search
 19 terms you used?
 20 A. Mostly what I do when I get on there
 21 is I'm chasing down references from other
 22 articles.
 23 Q. Okay.
 24 A. So I have the specific reference
 25 right there in front of me.

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1 KOENIGSHOFER
 2 Q. Do you recall whether you did any
 3 broad sweeping searches of literature based on
 4 specific keywords?
 5 A. I don't think I have. I might have
 6 done a search on Ultra Clean.
 7 Q. Okay. Did you collect and review
 8 articles based on that search?
 9 A. You know, whatever articles are
 10 checked or are included in there, I've at least
 11 gotten to the point of glancing at them,
 12 printing them at home, some of them I've read
 13 the abstract, some I read maybe more, some of
 14 them I've not even looked at yet, but are in
 15 that binder.
 16 Q. Okay. You mentioned Ultra Clean, is
 17 that Ultra Clean Ventilation?
 18 A. Yeah.
 19 Q. Do you have an understanding of the
 20 difference between Ultra Clean Ventilation
 21 versus other systems' ventilation in operating
 22 rooms?
 23 MS. ZIMMERMAN: Object to form.
 24 THE WITNESS: Ultra Clean appears to
 25 be a European expression that I don't know

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1 KOENIGSHOFER
 2 much about. That's why I Googled it.
 3 BY MR. GOSS:
 4 Q. Okay. So in your work in U.S.
 5 hospitals, you haven't installed or designed a
 6 system around an Ultra Clean or UCV system; is
 7 that fair?
 8 A. That is true.
 9 Q. Okay. Other than a search for Ultra
 10 Clean, were there any other searches you did
 11 for particular areas of interest?
 12 MS. ZIMMERMAN: Object to form.
 13 BY MR. GOSS:
 14 Q. In connection with your work on this
 15 report.
 16 A. Again, I didn't do generic word
 17 searches. I chased down particular articles
 18 that were referenced, and I said, hmm, I got to
 19 go read that.
 20 Q. And all of the articles that you
 21 would have reviewed are in binders 2 and 3; is
 22 that fair?
 23 A. Yes. For this case. I mean, I've
 24 been in this business for 40 years.
 25 Q. I understand that. Yeah. No. I

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1 KOENIGSHOFER
 2 accept that limitation.
 3 A. Okay.
 4 Q. I don't want to imagine all the
 5 things that you've read over 40 years.
 6 In your review of the literature, did
 7 you find -- do you recall reading any articles
 8 that found an increase in bacteria near the
 9 surgical site during Bair Hugger use?
 10 MS. ZIMMERMAN: Object to form.
 11 THE WITNESS: I would have to look at
 12 these articles. I believe I may have even
 13 made a comment in these reviews right
 14 here.
 15 The -- Legg found an increase in
 16 particles over the surgical site.
 17 BY MR. GOSS:
 18 Q. Did Legg search for or attempt to
 19 determine whether those particles carried
 20 viable bacteria?
 21 A. I'd have to go back and look at the
 22 article to -- to refresh my memory on that.
 23 Q. Which Legg, 2012 or 2013?
 24 A. This is '12. Legg, Cannon.
 25 (Thereupon, Exhibit 19 was marked for

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1 KOENIGSHOFER
 2 identification.)
 3 BY MR. GOSS:
 4 Q. Is Exhibit 19 the same as the one you
 5 have in your notebook?
 6 A. Yes.
 7 Q. If you can take a look at that and
 8 tell me whether Legg attempted to determine
 9 whether the particles they detected carried
 10 viable bacteria?
 11 A. It appears it was strictly a particle
 12 count, not CFU.
 13 Q. Okay. If you turn to table 2 on
 14 page 256. It has the mean number of particles
 15 over the surgical site.
 16 A. Yes.
 17 Q. So the -- just looking at the
 18 particles counted during the forced air, the
 19 .3 micron particles, the count was 1038.2 is
 20 the mean -- mean count; correct?
 21 A. Right.
 22 Q. And then the .5 particle size was
 23 30.8; correct?
 24 A. Right.
 25 Q. And then the 5 micron particle size

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1 KOENIGSHOFER
 2 is down to 3.6; correct?
 3 A. Yes.
 4 Q. And I think you said earlier that
 5 skin squames are typically 10 microns; correct?
 6 A. Yes.
 7 Q. So based on these results, there's
 8 nothing shown here for 10 microns, it stopped
 9 at 5. But is it fair to say that the number of
 10 particles that would be at the size of skin
 11 squames would be very low in this study?
 12 MS. ZIMMERMAN: Object to the form.
 13 THE WITNESS: I don't -- I -- I
 14 couldn't say.
 15 BY MR. GOSS:
 16 Q. Okay. It's 3.6 of the 5 micron
 17 particles versus more than a thousand and .3;
 18 correct?
 19 A. Right.
 20 Q. Okay. In the discussion, that second
 21 paragraph says, "Because of the nature of our
 22 experiment, we are unable to conclude that the
 23 use of the forced-air warming device, which
 24 produced a change in temperature and an
 25 increase in the number of particles over the

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1 KOENIGSHOFER
2 surgical site, would actually lead to an
3 increased risk of surgical site infection."
4 Based on your review of this data, do
5 you agree with their conclusion?
6 MS. ZIMMERMAN: Object to the form of
7 the question. The article speaks for
8 itself.
9 BY MR. GOSS:
10 Q. What's your opinion of the data
11 and -- and their conclusion? Do you disagree
12 with -- how they interpret it?
13 MS. ZIMMERMAN: I will object to the
14 form to the extent that it suggests that
15 the witness has been provided the actual
16 data, but you can answer the question
17 about the author's interpretation.
18 BY MR. GOSS:
19 Q. And just limited to what's in the
20 paper.
21 A. He's simply saying he can't make a
22 conclusion.
23 Q. Right. And looking at this data, do
24 you think that you can make a conclusion that
25 he didn't?

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1 KOENIGSHOFER
2 mark an exhibit.
3 (Thereupon, Exhibit 20 was marked for
4 identification.)
5 BY MR. GOSS:
6 Q. Is the copy -- is Exhibit 20 the same
7 as the copy you have in your notebook?
8 A. Yes.
9 Q. It's the same study anyway.
10 A. Yes. Mine is printed better than
11 yours. It's easier to read.
12 Q. That's fair. That's fair.
13 MS. ZIMMERMAN: Bigger font; right?
14 THE WITNESS: So Avidan did both. He
15 did the agar test as well as swabbing the
16 hoses.
17 BY MR. GOSS:
18 Q. All right. And with respect to the
19 agar plates, if you go to page 1074, the second
20 page says at the top, "Experiment 1: Are
21 microbes present in the airstream of warmers?"
22 It says, "Each warmer was placed
23 sequentially on a standard place on the floor.
24 The nozzle of the hose was suspended from an
25 infusion stand 40 centimeters above two agar

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1 KOENIGSHOFER
2 MS. ZIMMERMAN: Object to form.
3 THE WITNESS: I certainly could not,
4 with the data that is in front of me.
5 BY MR. GOSS:
6 Q. Okay. Do you recall encountering a
7 study in your review of the literature that
8 showed bacteria detected -- sorry, let me try
9 again.
10 Do you recall seeing a study that
11 found bacteria emitted from the Bair Hugger
12 blanket?
13 A. I saw one that had Bair Hugger --
14 bacteria from Bair Hugger hose.
15 Q. Okay. Was that Avidan?
16 A. Well, there's this one, and there's
17 also a guy -- is this the one where he did the
18 swabs? Because there's also one where a guy
19 swabbed the hoses too.
20 Q. Let's take a look.
21 A. This is agar plate, so I guess he was
22 just blowing air.
23 Q. Are you looking at Avidan?
24 A. This is Avidan.
25 MR. GOSS: Okay. Let me go ahead and

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1 KOENIGSHOFER
2 plates," correct?
3 A. Um-hmm, yes.
4 Q. And then the machine was turned on to
5 blow air at 43 degrees c over the plates for
6 five minutes.
7 40 centimeters, how -- roughly how
8 high is that? Is it --
9 A. Well, two and a half centimeters is
10 an inch, so it's, what, 12 inches or something.
11 Q. Okay. All right.
12 A. Fourteen.
13 Q. Okay. So a little more than a foot
14 off of the agar plates?
15 A. Uh-huh.
16 Q. Okay. With that setup would it be
17 possible for room air to be entrained in the
18 flow from the hose?
19 MS. ZIMMERMAN: Object to the form of
20 the question. Foundation.
21 THE WITNESS: You know, anything is
22 possible. I have not calculated what the
23 velocity of the air is from a Bair Hugger
24 hose.
25

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1 KOENIGSHOFER
 2 BY MR. GOSS:
 3 Q. Okay.
 4 A. As I think about it, 40 centimeters,
 5 that's -- that's a half a meter almost, so it's
 6 probably more like 18 inches. But anyway --
 7 Q. Okay.
 8 A. That order of magnitude.
 9 Q. Okay. In other words, the hose
 10 wasn't blowing directly on to the plate. It
 11 was --
 12 A. Yeah.
 13 Q. -- half a meter roughly from -- from
 14 the plates; correct?
 15 A. Yes.
 16 Q. All right. And they detected
 17 bacteria in some of the plates when they did
 18 that experiment; correct?
 19 A. They did.
 20 Q. But then they did a different
 21 experiment with agar plates under the Bair
 22 Hugger blanket; correct?
 23 A. Blankets were elevated over the agar
 24 plates. Doesn't say what the distance was
 25 there. I mean, in general, yes, what she said

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1 KOENIGSHOFER
 2 is true. I don't see in my --
 3 Q. The distance?
 4 A. -- in my 10 seconds of reading here
 5 that it says what the distance was between the
 6 plate and the blanket.
 7 Q. Okay. I don't think it does say, but
 8 you're welcome to look.
 9 But at any rate, as you observed in
 10 your report, when they had the blanket attached
 11 to the hose, they did not detect CFUs on the
 12 agar plates; correct?
 13 A. That is what they did in their
 14 report -- reported from their report, yes.
 15 Q. Okay. And that's .5b in your report,
 16 correct, on page 17?
 17 A. Yes.
 18 Q. If you turn to page point F, 5F,
 19 about Avidan, you mention that, "Recommend
 20 always use perforated blankets and microbial
 21 filter on hose, ensure hoses are sterilized
 22 regularly."
 23 With respect to perforated blankets,
 24 is it your understanding that -- or do you have
 25 an understanding as to whether 3M instructs

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1 KOENIGSHOFER
 2 users to always have the hose attached to a
 3 blanket during use?
 4 MS. ZIMMERMAN: Object to form. And
 5 foundation.
 6 BY MR. GOSS:
 7 Q. Did you review the operator's manual
 8 during your work in this case?
 9 A. Yes, I did. And yes, it does.
 10 Q. Okay. So that's Avidan.
 11 Do you recall -- and Avidan did not
 12 find bacteria emitted from the blanket;
 13 correct?
 14 A. Correct.
 15 Q. Did you find any studies that found
 16 bacteria emitted from the blanket?
 17 A. I found a study where soot was
 18 ejected from a blanket.
 19 Q. Okay. Is soot the same as bacteria?
 20 A. It is not.
 21 Q. In that paper where was the soot
 22 coming from?
 23 A. From the Bair Hugger.
 24 Q. What part of the Bair Hugger?
 25 A. From the -- well, the box, the black

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1 KOENIGSHOFER
 2 box.
 3 Q. Okay.
 4 A. Presumably from the heating elements,
 5 I don't know where within, but...
 6 Q. Was it -- was the source past the
 7 intake filter?
 8 A. It was.
 9 Q. Okay. So in other words, the soot
 10 was generated inside the machine post filter;
 11 correct?
 12 MS. ZIMMERMAN: Object to form. And
 13 foundation.
 14 BY MR. GOSS:
 15 Q. If you know. If you remember.
 16 A. I would have to make that assumption
 17 because there's almost nothing before the
 18 filter. All the mechanisms are after the
 19 filter.
 20 Q. Right. Right. Do you have an
 21 understanding -- or let me ask you this. Have
 22 you tried to measure the size of the pinholes
 23 perforations in the Bair Hugger blanket?
 24 A. I have not.
 25 Q. Do you have an understanding of how

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 2 big they are?
 3 A. I've seen that in the literature but
 4 I can't say at this minute.
 5 Q. The first study that you discuss in
 6 your literature review is the McGovern study;
 7 correct? That's point 1 on page 16?
 8 A. Yes.
 9 Q. All right. One of the authors is --
 10 is Albrecht; is that correct?
 11 A. Yes.
 12 Q. Do you know who he is?
 13 A. No.
 14 Q. Did -- did you know that Mark
 15 Albrecht was an employee of Scott Augustine?
 16 A. No.
 17 Q. Have you been provided any
 18 information regarding experiments that Mark
 19 Albrecht conducted to attempt to detect
 20 colony-forming units in the Bair Hugger
 21 airstream?
 22 MS. ZIMMERMAN: Object to form.
 23 THE WITNESS: I do not remember
 24 seeing such a thing.
 25

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 2 collected in HVAC filters."
 3 What do you mean by that sentence?
 4 A. Well, that the skin commensals did
 5 not come from the HVAC system. They were
 6 generated within the operating room itself
 7 after the air got in there.
 8 Q. Okay. And why do you say that the
 9 capture of those -- what does the filter have
 10 to do with that conclusion? I'm trying to
 11 understand.
 12 A. I'm just further making the point
 13 that 10-micron particles would not pass through
 14 an HVAC filter.
 15 Q. Okay. An HVAC filter that meets
 16 ASHRAE 170 Standards?
 17 A. Right.
 18 Q. And so if there are 10-micron
 19 particles generated in the OR, those particles
 20 are going to get captured in the HVAC filter
 21 when the air is recirculated; correct?
 22 A. Yeah. I mean, to the extent of
 23 whatever it is, 99.5 or 99.9. And it's not
 24 again -- it's not 100 percent.
 25 Q. Okay.

1 KOENIGSHOFER
 2 BY MR. GOSS:
 3 Q. Would you be interested in seeing the
 4 results of his studies, his attempts to detect
 5 colony-forming units in the Bair Hugger
 6 airstream?
 7 A. Sure.
 8 Q. In your discussion of McGovern --
 9 McGovern was the study that looked -- used a
 10 neutral buoyancy helium levels to look at
 11 airflow patterns; correct?
 12 A. Yes.
 13 Q. And it also looked at --
 14 retrospectively at patient data from a
 15 particular hospital in England; correct?
 16 A. I believe that's correct.
 17 Q. About midway through your discussion
 18 of McGovern you say, "Microorganisms in
 19 infections were predominantly skin commensals."
 20 What are "skin commensals"?
 21 A. I would say that's a squame.
 22 Q. And this indicates -- you go on to
 23 say, "This indicates generation of the
 24 particles occurred within the OR, as particles
 25 this size, approximately 10 microns, are easily

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 2 A. But, yes. After it gets back to the
 3 HVAC system.
 4 Q. Do you have an understanding of the
 5 HVAC system that was in use in the operating
 6 theater for the McGovern study?
 7 A. Same study?
 8 Q. Yes, sir.
 9 A. You know, I mean, only what's written
 10 in here. I mean, I have -- I don't have any
 11 more knowledge than what's in this report.
 12 (Thereupon, Exhibit 21 was marked for
 13 identification.)
 14 MS. ZIMMERMAN: Exhibit 22?
 15 MR. GOSS: 21.
 16 THE WITNESS: It says it's an Ultra
 17 Clean operating theater in the United
 18 Kingdom.
 19 BY MR. GOSS:
 20 Q. Okay. So are you familiar with an
 21 HVAC system called the Howorth Exflow 90?
 22 A. I am not.
 23 Q. If you go to the second page where it
 24 discusses the Ultra Clean operating theater
 25 characteristics. This is page 1538.

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1 KOENIGSHOFER
 2 MS. ZIMMERMAN: Left-hand column.
 3 THE WITNESS: Okay. Yeah.
 4 BY MR. GOSS:
 5 Q. Okay. It says, "Experiments were
 6 carried out in a partial walled Ultra Clean
 7 operating theater (Exflow 90 Howorth Bolton
 8 United Kingdom)."
 9 Further down it says, "Validation and
 10 verification checks, according to hospital
 11 technical memorandum 2025, show the operating
 12 theater airflows to be within specification and
 13 having a mean velocity of .44 meters per second
 14 and a height of 2 meters, which exceeds the
 15 threshold required by the standard, or
 16 .38 meters per second."
 17 So in terms of feet per minute, I did
 18 a Google calculation of .44 meters per second,
 19 that translates to about 87 feet per minute.
 20 Does that sound right?
 21 A. Yes, sir. I did a in-my-head
 22 calculation and came up with 80.
 23 Q. Okay. And then the standard they're
 24 referring to, presumably a UK standard, is
 25 .38 meters per second, that would be about

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 2 75 feet per minute; is that correct?
 3 A. Yes.
 4 Q. And that is substantially higher than
 5 the 25 to 35 feet per minute that ASHRAE 170
 6 requires; correct?
 7 A. It is.
 8 Q. And would you agree that at -- in
 9 fact, it's almost triple the velocity of what
 10 ASHRAE specifies; correct?
 11 A. Two and a half times.
 12 Q. Okay.
 13 A. Okay.
 14 Q. And at two and a half times the
 15 velocity, would you agree that that downflow
 16 speed has a substantially greater risk of
 17 disrupting the patient's wound thermal plume?
 18 MS. ZIMMERMAN: Object to form.
 19 THE WITNESS: If you believed in the
 20 thermal plume then, yes, I suppose it
 21 would.
 22 BY MR. GOSS:
 23 Q. Okay. If -- would you agree that at
 24 that velocity there is a substantially greater
 25 likelihood that squames shed by the surgical

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1 KOENIGSHOFER
 2 team will be impinged upon a patient in the
 3 surgical wound?
 4 MS. ZIMMERMAN: Object to form. And
 5 foundation.
 6 THE WITNESS: I couldn't say. I
 7 could not answer that question.
 8 BY MR. GOSS:
 9 Q. Would you agree that the increased
 10 downflow speed makes this bubble study -- it
 11 makes -- sorry, let me try again.
 12 Hospitals in the United States do not
 13 use diffusers with up to 90 feet per minute of
 14 velocity; correct?
 15 MS. ZIMMERMAN: Object to form.
 16 THE WITNESS: None of the ones that I
 17 know of.
 18 BY MR. GOSS:
 19 Q. Okay. Would you agree that that's an
 20 important limitation when attempting to
 21 extrapolate the findings of this helium bubble
 22 study to operating rooms in the United States?
 23 MS. ZIMMERMAN: Object to form.
 24 THE WITNESS: It would make a
 25 difference. It would make a difference.

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 2 I would -- I would expect it to make a
 3 difference.
 4 BY MR. GOSS:
 5 Q. Ultimately, the McGovern study
 6 authors say that their study does not establish
 7 a causal basis for an association between the
 8 use of forced-air warming and the increase in
 9 infections that they observed at their
 10 hospital; correct?
 11 A. Where are you? Back in the summary?
 12 Q. Actually, I'm on the -- page 1543.
 13 Where it says, "This study does not establish a
 14 causal basis for this association."
 15 A. Yes, I see that.
 16 Q. And would you -- based on your review
 17 of this study, would you disagree with their
 18 conclusion?
 19 A. I would not disagree with their
 20 conclusion.
 21 MS. ZIMMERMAN: Object to form.
 22 BY MR. GOSS:
 23 Q. The second paper that you cite is a
 24 Kowalski paper from 1998, which is on page 2
 25 of -- page 16 of your report.

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A. Yes.

(Thereupon, Exhibit 22 was marked for identification.)

BY MR. GOSS:

Q. All right. Is this the same Kowalski paper that you discussed?

A. Yes.

Q. Okay. And what you say about it is, "Table 3 confirms estimates of CFU per cubic meter to match" -- is it Galson or Galson and Goddard?

A. No, it's Galson. It's a typo.

Q. Okay.

A. Should be G-A-L.

Q. So table 3 confirms estimates of CFU per cubic meter to match Galson and Goddard as cited in figure 7 of this report?

A. Yes.

Q. All right. So let's go to figure 7 of your report.

A. All right.

Q. And it's a little difficult to read.

A. It is.

Q. But it's a slide based on --

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A. What page is it?

Q. Twenty-two.

Okay. Do you have a copy of Galson and Goddard, the paper itself? I tried to find it online and it wasn't available.

MS. ZIMMERMAN: 1968?

THE WITNESS: Yeah. I think that I do. I think I've read this thing.

BY MR. GOSS:

Q. Okay. And I --

A. A buddy of mine gave it to me.

Q. Okay. I looked in here and I didn't see it.

So if you have a copy, I would greatly appreciate one. But...

A. You went into the ASHRAE archives?

Q. You know, I haven't -- I haven't done that.

A. They are very good. I would expect it's --

Q. Okay. I might try that.

A. 1968 ASHRAE journal. I imagine it's in there.

Q. But what this figure is based on is

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Galson and Goddard's, I guess, measurements of CFUs --

A. Yes.

Q. -- and an article caused Hospital Air Conditioning and Sepsis Control.

A. That's right.

Q. All right.

A. This was real data, real hospitals in Atlanta.

Q. Okay. From 1968?

A. Yes, sir.

Q. Now, if we go to table 3 in Kowalski. This refers -- are you there? Page 40. Bottom of page 40.

A. Oh, okay.

Q. All right. This refers to microbial levels in indoor and outdoor air. I don't see a reference to Galson and Goddard, and I don't see any indication that these measurements relate to hospital air, do you?

A. I don't see that particular reference here.

Q. And the next page, it talks about table 3. It says, "Table 3 lists the results

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of various studies that include measurements of outdoor spore levels and typical average or representative indoor levels."

A. Okay.

Q. "These levels do not necessarily pose a health threat."

But I don't see a reference to Galson and Goddard in the references for the bibliography. So what I'm trying to understand is the connection between table 3 of Kowalski '98 and your figure 7.

A. All I'm simply saying, within the order of magnitude he's reporting, you know, 50 colony-forming units per cubic meter.

Q. Okay.

A. And Galson, he's got 10. And they need to make this comparison. One is in cubic meters and one is in cubic feet.

Q. Would you say with respect to particles and bacteria, if you're within the same order of magnitude, you're essentially saying it's -- the difference is nonsignificant?

A. Order of magnitude, I'm not sure I'd

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2 go that far. But, you know, a couple, three
3 times.

4 Q. Okay.

5 A. But actually, these numbers are
6 consistent. I did take that into account.
7 I -- I -- you know, a cubic meter is about
8 30 cubic feet, so it would be about 120.

9 Q. Okay. That's --

10 A. Four -- 4 cubic -- 4 CFU per cubic
11 foot would be about 120, plus or minus, per
12 cubic meter, which in my mind is consistent
13 with the numbers that are reported here.14 Q. So you just put your finger on
15 another difference. These -- table 3 is
16 reporting values in CFUs per cubic meter;
17 correct?

18 A. Yes. Kowalski's table 3, yes.

19 Q. Kowalski's table 3.

20 And your figure 7 shows values in
21 CFUs per cubic foot?

22 A. Yes.

23 Q. And you're saying that the difference
24 between a cubic foot and a cubic meter is how
25 much?

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2 A. About 30. About 30.

3 Q. If I said it was 35.3, would you have
4 any reason to disagree?

5 A. No.

6 Q. But you're saying that Kowalski's
7 table 3 confirms what's in your figure 7; is
8 that right?9 A. I'm saying the numbers are
10 consistent, which makes me feel better about
11 them.12 Q. And which numbers are you relying on
13 in Kowalski table 3?14 A. The colony-forming units per cubic
15 meter.16 Q. Okay. So that -- and that's that
17 first column, the lower limit CFUs per cubic
18 meter?19 A. Well, I mean, I'm just kind of
20 eyeballing the average range, the low, the
21 high.22 Q. For pathogenic bacteria they found
23 zero; is that correct?

24 A. That's what they said, yes.

25 Q. Point 3 --

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2 A. Let's look at this carefully. The
3 subtitle under that says "Suggested
4 Guidelines."

5 Q. Okay.

6 A. So --

7 Q. I'm just --

8 A. I would really have to look back
9 through this and dig deep to know if that's --
10 those are real numbers or if somehow he dug up
11 a bunch of guidelines.12 Q. All right. Well, that's what I'm
13 asking you, because you said that this supports
14 your figure and that's why I'm asking.

15 A. Okay. I think it does.

16 Q. Okay. Point 3 on your literature
17 review is the FDA Executive Summary on
18 Heating/Cooling Devices.

19 A. Yes.

20 (Thereupon, Exhibit 23 was marked for
21 identification.)

22 BY MR. GOSS:

23 Q. So you note in your comments that
24 this -- first of all, is Exhibit 23 the -- is
25 this a document you're referring to in your

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2 comments, the FDA Executive Summary?

3 A. Yes.

4 Q. Okay. You note that this is focused
5 on heating/cooling devices. Is there anywhere
6 in this document that you can recall a device
7 other than a heating/cooling unit being
8 discussed?9 A. I would have to reread this thing
10 again.11 Q. Okay. But in any event, the focus is
12 on heater/cooler devices, as it says on the
13 cover page; right?

14 A. That's what it says, yes.

15 Q. And you say that, "Some of the
16 observations in this executive summary are
17 pertinent to engineers considering the Bair
18 Hugger device, namely, A) the most likely
19 source of patient infection is through OR air."20 And I think we've already established
21 that that's not the case for surgical site
22 infections in hip and knee arthroplasty;
23 correct?24 MS. ZIMMERMAN: Object to form.
25 Misstates the testimony.

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1 KOENIGSHOFER
 2 THE WITNESS: I -- I'm simply quoting
 3 what they have said here.
 4 BY MR. GOSS:
 5 Q. Okay. But for surgical site
 6 infections in orthopedic surgery, or surgical
 7 site infections in general, you've already said
 8 that 5 to 15 percent are from airborne sources;
 9 correct?
 10 MS. ZIMMERMAN: Object to form.
 11 Again, misstates the witness' testimony.
 12 THE WITNESS: That is not correct.
 13 That's not what I said.
 14 BY MR. GOSS:
 15 Q. Okay.
 16 A. I did not limit it to surgery in
 17 operating rooms.
 18 Q. Okay. Well, let's go back to page 6
 19 of your report. Towards the bottom you say,
 20 "While there are many sources of
 21 microorganisms, most experts agree that
 22 airborne sources of infection are responsible
 23 for 5 to 15 percent of HAI;" correct?
 24 A. Yes. That is my statement. Yes.
 25 Q. Okay. "More than 50 percent of HAIs

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1 KOENIGSHOFER
 2 are caused by nonairborne sources;" correct?
 3 A. Yes. But I did not limited it to
 4 surgery. This might be people in -- patients
 5 in patient rooms. This might be somebody
 6 seating in an ED.
 7 Q. Okay. So do you have a different
 8 figure for surgeries?
 9 A. I don't know that number, but I'm
 10 certain that we could find one.
 11 Q. Okay. But as of right now, you don't
 12 have a breakdown of percentages of surgical
 13 site infections attributable to airborne
 14 sources versus others?
 15 A. I -- I don't know that number.
 16 Q. I think we talked about a graphic
 17 earlier that said the OR air was one of five
 18 potential sources of surgical site infections.
 19 Do you remember that?
 20 A. Okay. Yeah.
 21 Q. Okay.
 22 A. Are you referring to figure 3 in my
 23 report?
 24 Q. I might be. Let's take a look.
 25 A. Page 7?

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1 KOENIGSHOFER
 2 Q. No. There was a diagram with arrows
 3 pointing in different places. I can't remember
 4 where it is. You testified about it earlier.
 5 A. That's in my book?
 6 Q. Yes. That's where we saw it.
 7 A. I just saw it --
 8 Q. In Chapter 2?
 9 A. I just -- in thumbing this FDA thing,
 10 I just saw that same diagram. So --
 11 Q. Yes.
 12 A. So if you're really hot to trot, you
 13 can find the reference to it right there.
 14 Q. That will be more efficient.
 15 A. Page 28. Isn't that the same
 16 diagram?
 17 Q. It's a different diagram, but I think
 18 it makes the same point, that there are --
 19 A. That's XI. So that is
 20 Eurosurveillance.org.
 21 Q. Okay.
 22 A. I'm sure they didn't write that.
 23 Q. Right.
 24 A. So we still don't know the original
 25 author.

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1 KOENIGSHOFER
 2 Q. Okay. But at any rate, the graphic
 3 on page 28, figure 4, shows all the different
 4 permutations of factors that could end in
 5 transmission of infectious agents to patients;
 6 correct?
 7 A. Yes.
 8 Q. All right. And air is one of
 9 several; correct?
 10 A. Correct.
 11 Q. In comment you actually quote in 3C a
 12 statement from the report, Exhibit 23, that
 13 says, "Fans may facilitate the movement of
 14 aerosolized NTM from inside the unit into the
 15 operating room, and possibly into the sterile
 16 surgical field via laminar flow disruption;"
 17 correct?
 18 A. Yes.
 19 Q. Did you investigate the speed of the
 20 fans in the heater/cooler units?
 21 A. The ones that are cited in this
 22 report?
 23 Q. Yes, sir.
 24 A. No. No.
 25 Q. If you turn to page 25, there's a

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section there on "fans/vents."

A. Okay.

Q. It says, "Fans are found on all units and are usually used to cool the electronics and/or aid in the cooling efficiency of the compressor. The fan speeds range from 20 cubic feet per minute to over 700 cubic feet per minute."

And do you have an understanding of the fan speed -- well, first of all, just did I read that correctly?

A. You did.

Q. All right. And you would agree that 700 cubic feet per minute is significantly greater than the 50 cubic feet per minute that would come out of a Bair Hugger; correct?

A. Yes. But I don't believe that any of these devices have hoses on them that blow it into the --

Q. Okay.

A. -- around the patient.

Q. All right. So these devices have exhaust fans; correct? Where does the exhaust go?

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A. Into the operating room.

Q. Okay. And have you seen the video demonstrations of the smoke test that was done with these heater/cooler units?

A. I don't think I've seen that.

Q. Have you seen a video -- do you recall seeing a video where they put smoke in front of one of these machines, turned it on and watched the smoke blow over the operating table?

A. I haven't seen that.

Q. Okay. Where does the Bair Hugger exhaust air go?

A. Into the hose, into the blanket.

Q. Okay. And what's on top of the blanket? Is it your understanding that the patient has been draped and that there's a blanket on top of the blanket?

A. Yes. That's my understanding. I've never observed this.

Q. So the Bair Hugger, unlike the heater/cooler units, does not blow air directly out the back of the warming unit; correct? It delivers it through a hose and into a blanket?

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A. Correct.

Q. These devices were found to move air horizontally into the laminar flow field; correct?

MS. ZIMMERMAN: The heater/coolers?

MR. GOSS: Yes.

THE WITNESS: Yes. That's what they said.

BY MR. GOSS:

Q. Is it your testimony that the Bair Hugger moves air horizontally into the surgical field?

MS. ZIMMERMAN: Object to form. And foundation.

THE WITNESS: It blows it into the blanket and it goes somewhere. Goes down, hits the floor, goes horizontal.

BY MR. GOSS:

Q. But it doesn't go horizontally into the surgical field; correct?

MS. ZIMMERMAN: Object to the form of the question. Foundation.

THE WITNESS: Depends on the temperature.

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BY MR. GOSS:

Q. Okay. Can you explain for me a scenario in which the Bair Hugger warming unit would blow air horizontally into the surgical field?

MS. ZIMMERMAN: Object to the form of the question.

THE WITNESS: From what I've read there, and some of the -- I think even the Schlieren stuff -- however you say that word.

MS. ZIMMERMAN: Schlieren.

THE WITNESS: Schlieren. You know, some amount of that air was coming out around the patient's neck horizontally.

BY MR. GOSS:

Q. And is that in the direction of the surgical field?

A. It's in surgical field.

Q. Is it your testimony that the area behind the anesthesia stream is in the surgical field?

A. Well -- well, that's a good question.

And I don't know the medical definition. Okay?

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I'm an engineer.

Q. Okay.

A. For an engineer, the quote/unquote sterile field is the entire vertical array of the laminar flow of diffusers. And that's what we would call the sterile field. Now, you know, I'm not a clinician.

Q. Okay. I'm just looking at your summary of opinions on page 23. Opinion 4, this is the one where you say, "50," and you corrected it just to say "50 CFMs" --

A. Yeah.

Q. -- "are blown from the blanket into or near the sterile field causing air to move horizontally."

And what I'm asking is, what do you mean by "causing air to move horizontally"?

A. Well, again, at the floor, at the bottom of the drape, the air's got to go someplace; right? Which way does it move?

Q. So when it hits the floor it's got to go left or right?

A. And that is? Horizontal.

Q. All right. So it's not any more

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complicated than that. It hits the floor and it's got to go left or right; correct?

A. Yes.

Q. Have you measured the speed at which the air exits the drape?

A. No. I've never measured it. I can calculate it.

Q. Okay. Have you --

A. I have not calculated. I said I could.

Q. Okay. But you haven't done a calculation like that --

A. I haven't done it yet.

Q. -- for this report?

A. Correct.

Q. All right. You reviewed the executive summary from the meeting about the heater/cooler devices. Did you review a transcript of the testimony that was provided during that meeting?

A. No. I read only -- only this article here. And to be honest, glanced at that.

Q. So you wouldn't be familiar with testimony from a representative of a competitor

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called CardioQuip that the fans in the soaring units are capable of generating a thousand cubic feet per minute?

You wouldn't have heard of that?

A. I don't know about it.

Q. I'm sorry, cubic feet per minute. I said feet per minute, it's cubic feet per minute.

Let's see. Number 4, we talked about Legg. Number 5, we talked about Avidan.

Okay. Study number 6 is the Sharp paper from 2002. And what was significant to you about the Sharp paper?

A. Well, as stated in my report, "Smoke test revealed that blanket airflow had no significant effect on the theater airflow."

Q. Okay. And then point B is, "No colonies were grown in any of the groups tested and our results suggest that the patient-warming system does not influence bacterial counts at the operating site in an Ultra Clean air ventilated theater, even with patients who have high shedding of skin cells;" correct?

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A. Yes.

Q. And how do those two points, the smoke test and a lack of difference in the colonies grown, how do those factor into your opinions in this case?

A. Well, I believe that in this test, under these circumstances, these are their results.

Q. Number 7 is Legg and Hamer from 2013. You didn't note anything about it.

A. That's because I hadn't read it yet. It was my intention to read it.

Q. Okay. All right.

(Thereupon, Exhibit 24 was marked for identification.)

BY MR. GOSS:

Q. This is the Legg and Hamer from 2013.

A. Uh-huh.

Q. I understand you haven't read this, so if you want to take a minute to read the abstract, please go ahead.

A. Okay.

MR. ASSAAD: You could read the whole thing if you need to.

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1 KOENIGSHOFER
 2 BY MR. GOSS:
 3 Q. If you need to. That's fine.
 4 A. I'm kind of a slow reader.
 5 MR. GOSS: We could always follow
 6 the -- Gabe's rule from before. No
 7 reading on the record.
 8 MR. ASSAAD: Off the record.
 9 THE VIDEOGRAPHER: Are we off record?
 10 MR. GOSS: Yes.
 11 (Off the record.)
 12 THE VIDEOGRAPHER: On the record at
 13 5:40 p.m.
 14 BY MR. GOSS:
 15 Q. Have you had a chance to review the
 16 Legg and Hamer paper, which is Exhibit 24?
 17 A. I have had a chance to glance over
 18 it, yes.
 19 Q. And the only thing I wanted to call
 20 to your attention is on page 409. In the
 21 discussion about halfway, a little more than
 22 halfway down the right-hand side, it says, "It
 23 does not appear that the forced-air warming
 24 device itself blows potentially contaminated
 25 warm air directly into the Howorth enclosure;"

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1 KOENIGSHOFER
 2 correct?
 3 A. That's what it says.
 4 Q. Okay.
 5 A. It's what I had boxed in already.
 6 Q. So are you saying anything different
 7 from what this says? I mean, I understand --
 8 well, let me just ask you this way.
 9 Is it your testimony that the Bair
 10 Hugger warming unit does introduce contaminated
 11 air directly into the surgical field?
 12 A. Yes, I think it will.
 13 Q. How would it do that directly into
 14 the surgical field?
 15 A. Well, by pulling the air --
 16 contaminated air from the floor. Okay. It's
 17 MERV 14, but it is not perfect. MERV 14.
 18 It's not perfect. So some amount of particles
 19 get through it.
 20 BY MR. GOSS:
 21 Q. Okay.
 22 A. They get through the hose. They get
 23 through the blanket. They get through the
 24 holes in the blanket. I mean, maybe each time
 25 along the way there's a reduction. I'm not

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1 KOENIGSHOFER
 2 disputing that it would be. But it would still
 3 get through, and some amount of it might come
 4 up around the neck.
 5 I don't know how well the Bair
 6 Hugger's taped at the bottom. Maybe some air
 7 leaks there. I don't know. I have not
 8 witnessed that.
 9 But in any case, then, just as they
 10 say in here, it comes out, goes down the drape.
 11 It's still hot. It hits the floor. It
 12 convects back up and circulates back in and
 13 around my nice clean air --
 14 Q. Okay.
 15 A. -- that I worked so hard to create.
 16 Q. Now, that sounds to me like -- that
 17 does not sound to me like direct in the sense
 18 of the blanket is blowing contaminated air
 19 directly into the surgical field. And that's
 20 my question.
 21 Is it your testimony that it blows
 22 contaminated air directly into the surgical
 23 field?
 24 A. What is your definition of "the
 25 surgical field"?

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1 KOENIGSHOFER
 2 Q. The area that the surgeon is
 3 operating on.
 4 A. Within that limited definition, then
 5 I would agree with you.
 6 Q. And you mentioned that the air, when
 7 it comes out of the Bair Hugger, is still hot;
 8 correct?
 9 A. It's warm.
 10 Q. What -- have you attempted to measure
 11 or research the temperature?
 12 A. I haven't, but I've seen articles
 13 that are saying 75 and some people are saying
 14 90, and --
 15 Q. Okay.
 16 A. -- I don't know where all that heat
 17 would go. And in any case, a BTU is a BTU. It
 18 doesn't disappear. It equals mc squared and
 19 all that stuff.
 20 Q. Okay.
 21 A. So --
 22 Q. Who's saying that the temperature is
 23 90 when it exits the blanket?
 24 A. Geez, I -- I cannot right off the top
 25 of my head give you that citation.

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Q. Okay.

A. I feel like I've read that.

Q. But have you reviewed --

A. It's like 32 degrees, right?

Q. Thirty-two Celsius?

A. Uh-huh.

Q. I do not know the conversion off the top of my head.

A. Yeah. It's 89 point something.

Q. All right. Probably move on from this.

MR. ASSAAD: 89.6.

THE WITNESS: I'll go with my 90 estimate.

Q. Well, are you saying -- are you estimate -- when you say "90 estimate," that's the conversion factor, correct, the 32C?

A. Yes.

Q. You're not saying that you estimate the temperature of the air coming out of the Bair Hugger is 90?

A. I feel like I saw something that said it was 33 degrees Celsius.

Q. Okay. Well, the temperature setting

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on the device is 43 degrees Celsius --

A. Yes.

Q. -- correct?

A. Correct.

Q. Okay. And then -- and then the question is, once that air leaves the Bair Hugger blanket, what's the temperature of that air within, say, a few inches of the blanket?

A. I've never measured it.

Q. Okay. Have you seen Professor Tom Kuehn's measurements of temperatures that he took from the Bair Hugger blanket?

A. Yes, I've seen those.

Q. Okay.

A. I will probably need to pull my notes out of that pile if you're going to --

Q. I can show them to you.

A. If you're going to ask me questions about it.

Q. You know, the only question I wanted to ask you about it is, did he measure 75 degrees about 6 inches from the Bair Hugger -- from the patient's head and neck? Do you recall seeing that?

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I can show you --

A. I -- I don't know. I'm getting my references confused here, because one of the guys who -- I read the reviews of my report.

Q. Okay.

A. And one of the guys said, oh, Dan's full of beans because the air leaving that is only 75 degrees.

Q. All right.

A. And I don't recall which guy said that.

(Thereupon, Exhibit 25 was marked for identification.)

BY MR. GOSS:

Q. So this is Exhibit 25, which it's not labeled, but I'll represent to you that it's Exhibit B to Tom Kuehn's report.

And on that first page he's recorded -- or he reports to -- he's reporting measurements that he took with the anemometer probe about 3 inches from -- no, it says 3-inches from the blanket edge.

Do you see that?

A. Are you on first page here?

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Q. First page, yes, sir.

A. Yeah. I guess it's unclear but, I guess, that this hose is plugged into a blanket; correct?

Q. Yeah.

A. It's unclear from this picture but, I guess, that's --

Q. The blanket is all draped off.

A. And so then what has he done? He's taped the whole thing down with the exception of that little V-shaped hole that's lifted up there?

Q. Yeah. And what -- I believe what he said in his report is that this is a mannequin that's prepped and draped for a hip surgery.

A. Okay.

MS. ZIMMERMAN: So I'm just going to, for the record, make an objection that to the extent that we're characterizing any of the measurements or experiments that Mr. Kuehn did, none of us are in a position to know exactly what he did.

MR. GOSS: Sure.

MS. ZIMMERMAN: Certainly based on

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1 KOENIGSHOFER
 2 this.
 3 THE WITNESS: That's for sure. I got
 4 a hundred questions already.
 5 BY MR. GOSS:
 6 Q. All right. But at any rate, his
 7 recording -- his temperature recordings from
 8 that location, after 15 or 16 minutes he gets
 9 almost 75 degrees; correct?
 10 Just on the first page.
 11 A. Oh, we're just still on the first
 12 page?
 13 Q. Second page. That's right.
 14 A. Yeah.
 15 Q. Have you seen any other temperature
 16 measurements taken from a draped Bair Hugger
 17 unit, anything similar to this?
 18 MS. ZIMMERMAN: Other than the
 19 reports that he cites to?
 20 MR. GOSS: Other than what? I'm
 21 sorry.
 22 MS. ZIMMERMAN: Reports that are
 23 cited to in his paper?
 24 MR. GOSS: Which reports are those?
 25 MS. ZIMMERMAN: Well, he -- we've

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1 KOENIGSHOFER
 2 Q. -- you talk about the Sessler and
 3 Olmsted --
 4 A. Yes.
 5 Q. -- paper; correct?
 6 A. Right.
 7 Q. And you comment on page 19 -- hold on
 8 a second. At the bottom of page 18 you note,
 9 "They introduced 35 million particles per meter
 10 cubed. They acknowledged this is much higher
 11 than a normal OR. This baseline is then used
 12 for the statistical analyses. And compared to
 13 this very large number, small differences are
 14 insignificant."
 15 So is that your testimony, that
 16 compared to this very large number, small
 17 differences are insignificant?
 18 A. Yes.
 19 Q. Ten is the deposition of corporate
 20 representative Al Van Duren. And you note, "3M
 21 also admits that all data that is currently
 22 available indicates that the Bair Hugger
 23 increases particles over the sterile surgical
 24 site."
 25 And I guess I'm not going to ask you

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1 KOENIGSHOFER
 2 been asking them about all day.
 3 MR. GOSS: I'm just asking
 4 temperature measurements of air coming out
 5 of the Bair Hugger blanket.
 6 MS. ZIMMERMAN: Okay.
 7 THE WITNESS: Again, I feel like I
 8 have seen it in all this material. At
 9 6:00 o'clock at night you asked me to cite
 10 you the chapter and verse. I can't do
 11 that, to be honest with you.
 12 BY MR. GOSS:
 13 Q. Fair enough. Fair enough.
 14 But you haven't seen similar
 15 measurements taken by any other plaintiff's
 16 expert; correct?
 17 A. As I said, I feel like I've seen
 18 temperatures.
 19 Q. Okay. I will move on.
 20 A. Okay.
 21 So I will note to you, I'm surprised
 22 by how late it is.
 23 Q. Point 9 on your paper you talk about
 24 the -- on page 18 in your report --
 25 A. Yes.

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1 KOENIGSHOFER
 2 to hunt through the deposition for what you're
 3 citing there. But would you agree with me that
 4 an increase in particles over the sterile
 5 surgical site does not necessarily equate to an
 6 increase in bacteria over the sterile surgical
 7 site?
 8 A. Well, once again, I feel like there
 9 is some correlation. It might be 1 percent.
 10 It might 100th a percent. It might be a
 11 billionth a percent. But, yes, I do feel like
 12 the more particles there are, the more
 13 colony-forming units there are.
 14 Q. Okay. Is that a linear relationship
 15 or how would you characterize the correlation?
 16 MS. ZIMMERMAN: Object to form.
 17 Foundation.
 18 THE WITNESS: I don't know.
 19 BY MR. GOSS:
 20 Q. Okay. Number 11 is the deposition of
 21 Dr. Robert Crowder. Point B you say, "3M had
 22 never asked for testing of filters by Pentair
 23 until July 2016."
 24 Have you seen any test data that 3M
 25 obtained through Pentair from an earlier time

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1 KOENIGSHOFER
2 than July 2016?
3 A. I haven't.
4 Q. Okay.
5 A. But I do have that.
6 Q. Okay.
7 A. Again, I'm saying that I -- that's --
8 again, I read this thing two months ago, three
9 months ago. I recall him saying that.
10 Q. Number 12 you say that -- you're
11 referring to a filter test by Camfil Farr. And
12 that's a big filter company; correct?
13 A. Yes, it is.
14 Q. You describe, "Flat filter efficiency
15 measured at 72 percent at 0.4 micron. MERV 14
16 is 75 to 85 percent at 0.3 to 1 micron. So the
17 filter 3M uses is MERV 13, at best."
18 Did I read that correctly?
19 A. Yes.
20 (Thereupon, Exhibit 26 was marked for
21 identification.)
22 BY MR. GOSS:
23 Q. Is Exhibit 26 the document that you
24 were referring to?
25 A. Yes.

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1 KOENIGSHOFER
2 A. Yes. Right.
3 Q. So you agree with me that this does
4 not appear to have been conducted according to
5 52.2?
6 MS. ZIMMERMAN: Object to form of the
7 question. Foundation.
8 THE WITNESS: This piece of paper
9 does not give all the information that one
10 would expect for the particle sizes in the
11 MERV 14 test.
12 Q. Okay. All right.
13 A. I don't know what 52.2 even had when
14 this test was done.
15 Q. So you were saying about Exhibit 26
16 that --
17 A. I was just reading the top. I
18 thought the top thing says test and then I
19 thought that was a date. I'm sorry.
20 Q. Okay. Well, there is a date on the
21 next page. It says, "25 August '06."
22 Do you see that?
23 A. Yeah.
24 Q. And so what's the relevance of the
25 date to the document for you?

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1 KOENIGSHOFER
2 Q. And can you tell from this document
3 whether this test was performed according to
4 ASHRAE 52.2?
5 A. I -- I don't know the ASHRAE 52.2
6 test methodology.
7 Q. Okay. Have you ever seen a test
8 report for a filter that is put through a 52.2
9 test?
10 A. Well, only in the sense if I'm
11 looking to recommend a filter, and I'm looking
12 at Camfil's website or American Air Filter's
13 website or whoever, they probably will say that
14 they -- according to 52.2 we did this test and
15 here's the results.
16 Q. Okay. We spoke earlier about the
17 particle size ranges the 55.2 tests; correct?
18 A. Yes.
19 Q. There's .3 to 1 micron, 1 to
20 3 microns, and then 3 to 10 microns; correct?
21 A. I believe that's what we said. Yeah.
22 Q. All right. So if you look at this
23 graph below, the units are hard to read, but it
24 looks like the highest it goes is about
25 .9 microns; correct?

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1 KOENIGSHOFER
2 A. I don't know what version of 52 we
3 had at that point. And honestly, I don't know
4 if even 52 had even been published at that
5 point.
6 Q. Okay. So you don't know whether
7 there was a 52 --
8 A. There might not have been a 52 at
9 that point.
10 Q. In 2006?
11 A. 2006.
12 Q. Okay.
13 A. I'm simply saying I don't know that
14 there was.
15 (Thereupon, Exhibit 27 was marked for
16 identification.)
17 (Thereupon, Exhibit 28 was marked for
18 identification.)
19 BY MR. GOSS:
20 Q. All right. If you look at Exhibits
21 27 and 28, have you ever seen test reports like
22 these for a filter?
23 A. No.
24 Q. If you look at 27, it says, at the
25 top, "Test Report ASHRAE Test Standard 5.22

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2012 New Classification;" correct?

A. Uh-huh. Yes.

Q. And then below that it says, "Bair Hugger filter model 505;" correct?

A. Yes.

Q. And in the test results, first it indicates the test airflow rate and CFMs and then the velocity and feet per minute; correct?

A. Yeah.

Q. So that's 48 CFMs was the flow rate and the velocity was 118 feet per minute?

A. Uh-huh. Yes.

Q. And then it lists an initial resistance in WG and a final resistance in WG; correct?

A. Yes.

Q. All right. And "WG" stands for water gauge; correct?

A. The whole thing stands for inches of water gauge, yes.

Q. Okay. What is your understanding of the difference between initial resistance and final resistance?

A. Well, "initial" is one brand-new out

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of the box. And "final" would be after it has been run. That would be, in my experience, a very high number to run a filter to.

Typically when you buy a filter, you buy something from Camfil, and it will say "replace at" -- usually like 1.5 inches. I don't recall ever seeing one that would say, run it up to 2.5 inches.

Q. All right. And then it says, "The minimum efficiency rating value is MERV 14 at 48 CMF;" correct?

A. Uh-huh. Yeah.

Q. And then it breaks down the minimum average efficiency at the three different particle ranges; correct?

A. Yes.

Q. Does this appear to you to be a test report that's consistent with requirements of 52.2?

MS. ZIMMERMAN: Object to form. Foundation.

THE WITNESS: I would guess that it matches 52 because they state that it does. But that is the test of a filter in

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a laboratory.

BY MR. GOSS:

Q. Okay. If you'll turn to the second page -- by the way, you're -- so you're distinguishing between a test of a filter in a laboratory and a test of a filter in the field, is that what you're suggesting?

A. I've had this only -- for only one or two minutes here. But I expect that this is all they did is to test the filter in their laboratory in their setup.

Q. Okay.

A. It was not in a Bair Hugger.

Q. Right.

A. So --

Q. Did you ask --

A. -- it was in a perfectly beautiful sealed-in device.

Q. Okay.

A. Perfectly. We've got quarter-inch stainless steel ends on this thing and wonderful perfect gaskets installed by a Ph.D technician in the laboratory.

Q. Do you know that these people are

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Ph.D technicians?

A. No, I don't know. I'm just making this shit up.

Q. I think I understand.

A. Hey, you know what, it does. Yes. In fact, I do know.

Q. Okay.

A. That says it right there.

Q. All right. There you go.

A. Dr. Kwak.

Q. All right. So you're distinguishing from that situation and the performance of a filter in the Bair Hugger in the field; correct?

A. Yes, sir.

Q. But you yourself did not attempt to determine the filter efficiency or performance of the filter of a Bair Hugger unit in the field; correct?

A. That's correct.

Q. So on the second page there are different fractional efficiency results listed for the different delta Ps, which is the change in pressure; correct?

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A. Right.

Q. And if you look at the initial resistance of .508 inches those are all the lowest values that are recorded at the far end of the table; correct?

A. I'm sorry?

Q. Do you follow?

A. Say that -- well, no, I don't. Say that again.

Q. Okay. Sorry.

What I want to compare is the initial resistance of .508 inches of water.

A. Got it.

Q. And the final resistance of 2.5 inches of water; correct?

A. Okay.

Q. All right. And the fractional efficiency at the final resistance begins at 99.1 and goes up to 100; correct?

A. Yes.

Q. Starting with the .3 to .4 micron size range; correct?

A. Yes.

In the 2.5 column you're talking

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about?

Q. Yes, sir.

A. .7 to 1.0 size range.

Q. That's where it goes to 100 percent; correct?

A. I thought that was your question.

Q. No. I'm sorry.

It starts -- it starts at 99.1 and .3 to .4; correct?

A. Yes.

Q. All right. And then it increases --

A. Yes.

Q. -- from there?

A. Uh-huh.

Q. All right. Exhibit 28 is a similar report on the rectangular filter; correct?

A. Yes.

Q. And this too would appear to be a test report or claims to be a test report per 52.2; correct?

A. Yes. That's their statement.

Q. And it reports a MERV value of MERV 14; correct?

A. Yes.

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Q. After you saw this Camfil document in Exhibit 26, did you ask counsel if there was other efficiency testing that they could provide you on the Bair Hugger filters?

MS. ZIMMERMAN: Object to -- pardon me. Object to form and to the extent it calls for attorney-client -- pardon me -- attorney work product, I'm going to instruct the witness not to answer.

BY MR. GOSS:

Q. Did you want to see other efficiency data if it existed?

A. I have wanted to see other tests.

Q. You reviewed a deposition of Dr. Robert Crowder. Do you recall reading his testimony that his understanding was that both of the filter medias that Pentair supplied to 3M and Arizant would be capable of removing bacteria?

MS. ZIMMERMAN: Object to the form of the question.

THE WITNESS: It's a wonderful question. And I don't remember the answer to that.

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Q. Do you have any reason to disagree with his testimony that the filters Pentair or Porous supplied to 3M or Arizant would be capable of removing bacteria?

A. Capable of removing bacteria. I'm sure that they could remove some bacteria.

Q. Do you have an opinion as to the -- strike that.

On item 14 you cite a paper by Brandt and Oguz, among others, comparing the efficacy of resistive polymer and forced-air warming.

A. Yes.

Q. And this paper is from 2010; right?

A. Yes.

Q. Have you seen a more recent paper by Oguz comparing the levels of bacteria in the operating room during procedures performed with the Bair Hugger versus a resistive polymer device?

A. No. No. I have not seen that with that particle.

(Thereupon, Exhibit 29 was marked for identification.)

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 2 BY MR. GOSS:
 3 Q. If you want to take a minute to look
 4 at the abstract.
 5 A. All right.
 6 Q. So this says their study objective,
 7 they say, "several factors such as lack of
 8 unidirectional turbulent-free laminar airflow,
 9 duration of surgery, patient-warming system,
 10 for the number of health professionals in the
 11 OR have been shown or suspected to increase the
 12 number of airborne bacteria."
 13 A. Yes.
 14 Q. "The objective of this study was to
 15 perform a multi-variate analysis of bacterial
 16 counts in the OR in patients during minor
 17 orthopedic surgery"; correct?
 18 A. Yes.
 19 Q. They looked at 80 patients undergoing
 20 minor orthopedic surgery; correct?
 21 A. Uh-huh. Yes.
 22 Q. The surgery took place in ORs with
 23 and without a unidirectional turbulent-free
 24 laminar airflow system. Patients were
 25 randomized to warming with a forced air or an

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 2 electric warming system.
 3 A. Okay. Yes.
 4 Q. And they measured the number of
 5 airborne bacteria using sanitation agar plates
 6 and nitrocellulose membranes. And the results
 7 of the multi-variant analysis showed that the
 8 absence of unidirectional turbulent-free
 9 laminar airflow and longer duration of surgery
 10 increased bacterial counts significantly. The
 11 type of patient warming system and the number
 12 of health professionals had no significant
 13 influence on bacterial counts on any sampling
 14 site; correct?
 15 A. That's what it says.
 16 MS. ZIMMERMAN: Objection to form.
 17 Q. Did I misread it?
 18 A. No. That's what it says.
 19 MS. ZIMMERMAN: You read it.
 20 BY MR. GOSS:
 21 Q. So this study, according to the
 22 authors, did not find a difference in bacteria
 23 levels near the surgical site that they could
 24 attribute to the warming system used in the
 25 procedure; correct?

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 2 MS. ZIMMERMAN: Objection to form.
 3 THE WITNESS: That's what they say.
 4 Q. Does this more recent Oguz paper
 5 affect your opinions at all in this case?
 6 A. Not at all. I think it confirms my
 7 opinions, based on the abstract.
 8 Q. So which of your opinions does it
 9 confirm?
 10 A. Well, for one, the importance of the
 11 laminar airflow. For two, that little part of
 12 my equation that says "dosage in time". The
 13 longer you're in there, the more bugs bite you.
 14 That's what they are saying here. I like that.
 15 I'd say that even though they used 80
 16 patients, if you break down all the different
 17 variables, you know, you'd really have to do an
 18 analysis of this, but --
 19 Q. Are you a statistician?
 20 A. To the point that I could divide 80
 21 by 2, yes. And then I could divide 40 by 2,
 22 yes. I could do that right here on the spot.
 23 And I have now got 20 people within
 24 any group of, do you have a Bair Hugger, "yes"
 25 or "no"? Do you have laminar flow, "yes" or

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 2 "no"? Now you've got 20 people.
 3 Q. All right. You indicate that you
 4 reviewed Dr. Elghobashi's report; correct?
 5 A. Yes.
 6 Q. Is Dr. Elghobashi an ASHRAE member?
 7 A. I don't even know the answer to that
 8 question.
 9 Q. Are you aware of any work that he has
 10 done for ASHRAE?
 11 A. I'm not aware of any work that he has
 12 done.
 13 Q. Does Dr. Elghobashi's model account
 14 for the fact that the Bair Hugger incorporates
 15 a MERV 14 filter? Did you see any reference to
 16 that in his report?
 17 MS. ZIMMERMAN: Object to form and
 18 foundation.
 19 THE WITNESS: I don't remember.
 20 Q. Have you seen Dr. Memarzadeh's letter
 21 to the editor about his CFD modeling of Bair
 22 Hugger air?
 23 A. I have not seen that. I would like
 24 to see it. You got it?
 25 Q. Yes, sir.

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A. Cool.

(Thereupon, Exhibit 30 was marked for identification.)

BY MR. GOSS:

Q. Exhibit 30 is a letter to the editor in the Journal of Hospital Infection; correct?

A. Yes.

Q. You do not recall having seen this before?

A. I have not. I have heard of its existence.

Q. All I would ask you about this, since you have not had a chance to read it, obviously you have not attempted to reconcile what Memarzadeh says with what Dr. Elghobashi says; correct?

A. That is correct.

Q. If you'd just look at the last paragraph of this. It says, "This investigation validates Moretti's et al's conclusion that forced-air warming technology does not increase the risk of surgical wound infection."

Obviously that's a different

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conclusion from what Dr. Elghobashi arrived at; correct?

A. Yes.

Q. On page 21 of your report you talk about the Bair Hugger filtration; correct?

A. Yes.

Q. You say, "If we assume the air near the floor of an OR is as clean as a standard hospital, which meets ASHRAE minimum standards, that is 10 CFU per cubic foot"; correct?

A. Yes.

Q. I want to look back at figure 7. That 10 CFU per cubic foot is for general hospital areas; correct?

A. Yes. I was specifically saying the air near the floor.

Q. Okay. So --

MS. ZIMMERMAN: For the record, Counsel, are you talking about his figure 7 in his report?

MR. GOSS: Yes. Exactly. On page 22.

BY MR. GOSS:

Q. The part that I can read says, 10 CFU

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per cubic foot per general hospital areas. For general surgery, autopsy, isolation, the emergency it says 4 CFU per cubic foot; right?

A. Yes.

Q. But you chose 10 CFU per cubic foot because you're measuring CFUs near the floor?

A. Yes.

Q. Ten per cubic foot, if you express it in cubic meters, that would be how many?

A. Ten divided by 30, so .3 -- no, no, the other way around. I'm sorry. 300 -- 350.

Q. 350 CFUs per cubic foot.

A. Per cubic meter.

Q. Per cubic meter. Sorry. Thank you.

Would you agree with me that that would be an extraordinarily high number of CFUs to have in an operating room?

A. I don't -- I don't have a number for that. Other than what Galson says, you've got 2 to 4.

Q. We looked at some studies --

A. Why are we confusing ourselves by converting all of this to cubic meters when they're already cubic feet?

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Q. Well, we looked at some other studies that provided airborne CFUs and CFUs per cubic meter; correct?

A. I'm sure we have sometime today, yes.

Q. Some of them were under 5, some were under 10; correct? I think one of them was 35.

A. Was that per meter or per foot? At this point, I honestly can't remember.

MS. ZIMMERMAN: If you want to refer him to something, I'm sure he will be happy to look at it.

MR. GOSS: Sure.

BY MR. GOSS:

Q. Exhibit 18 was the Der Tavitian paper.

A. I just got there too. Colonies per cubic meter. Tavitian from -- I don't know -- 6 to 12 or something, 14.

Q. CFUs per cubic meter?

A. Yeah. On the second -- third page.

Q. So Cristina paper, 17. In the abstract of it says, "Considering the total number of surgical operations the mean value is 35 CFU per cubic meter"; correct?

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A. Yes. That is what she reports her -- anyway, yeah.

Q. And for your hypothetical calculation you're assuming a level of CFUs in the OR about 10 times that; correct?

A. Yes, sir.

Q. And your calculation is based on an assumption that the filter is 90 percent effective; is that right?

A. Yes. That is what I had said.

Q. Do you intend to revisit your calculation now that you have been provided some other data surrounding the Bair Hugger filters?

A. No. Because you have not yet supplied me any data for how it works inside a Bair Hugger.

Q. And you haven't conducted any testing of your own to determine that?

A. I have not.

Q. Moving on to your summary of opinions on page 22. Your first opinion, "The Bair Hugger operating in an OR will create turbulence at the floor stirring settled

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particles."

Opinion number 2, "The Bair Hugger draws particles off the floor into the unit. It functions much like a household vacuum cleaner."

What is your basis for that second statement?

A. Because it sucks particles off the floor. The legs of the Bair Hugger, the one that I looked at, the ones that sit on the floor, it's actually about a half an inch. So actually my calculation, when I did it, I assumed 1 inch.

Q. Okay.

A. With the little rubber feeder on it about a half an inch, so that the velocity was actually even higher.

Q. So what size particles did you measure it sucking up from the surface?

A. I didn't --

MS. ZIMMERMAN: Object to the form of the question.

Q. Or did you?

A. I did not measure. I've already

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answered that question numerous times.

Q. You're saying it functions much like a household vacuum cleaner.

A. Hmm-mmm.

Q. Is that based just on your calculation of the velocity?

A. Yes, it is.

Q. Have you done any calculations of the velocity required to dislodge a 10-micron particle from the surface?

A. I have not.

Q. Have you refinished a piece of furniture?

A. I have.

Q. I have too. I suspect Genevieve has. Have you ever sanded a surface and then vacuumed it?

A. Of floors, yes. Yeah. Sure.

Q. And then in my experience, I have wiped that surface after vacuuming it and been surprised to see particles.

A. What size were the particles that were left?

Q. I don't know. All I know is that the

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particles --

A. I don't know either.

Q. -- the particles weren't vacuumed by the vacuum; correct?

A. Right.

Q. Did you make any attempt to determine whether the Bair Hugger actually functioned like a household vacuum cleaner in this case?

MS. ZIMMERMAN: Objection to the form of the question. I think it's argumentative and it has been asked and answered.

BY MR. GOSS:

Q. You can answer.

A. I've already said I didn't do any testing on this.

Q. Got it.

"The performance of the filter assembly is not appropriately or correctly documented." I think we've established that you, before today, hadn't seen all the documentation relating to the Bair Hugger filters; correct?

MS. ZIMMERMAN: Object to the form of

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2 the question. There are documents he
3 still hasn't seen relating to the --

4 THE WITNESS: I mean, this is based
5 on the exploded view of the one that I
6 looked at.

7 Q. Okay. What documentation were you
8 expecting to see?

9 A. It says nothing about the type of
10 gasket that it has. The thickness of the
11 gasket. The adhesiveness of the gasket. If
12 there is a gasket.

13 Q. Do you know whether there is a gasket
14 on the Bair Hugger filter?

15 A. I don't know.

16 Q. Did you ever ask counsel to provide
17 you exemplar filters?

18 A. No. I've asked if I could buy a Bair
19 Hugger.

20 Q. Okay.

21 A. But I haven't done it yet.

22 Q. In your last four opinions on
23 page 23, you say number 1, "The filters in the
24 Bair Hugger are less efficient than those used
25 in the HVAC system serving an OR." Is that

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2 based on the Camfil document that you reviewed?

3 A. It is based on the Camfil document
4 that I reviewed. It is based on, especially
5 the units that have got the flat filter. Flat
6 filters are notorious for warping like this.
7 And lacking better information that I had, it's
8 not unreasonable to assume that at certain
9 times that filter might go wonky and you get
10 leakage past it. (indicating)

11 MS. ZIMMERMAN: Just for the record,
12 the witness is gesturing with a piece of
13 paper to mimic a flexion in a rectangular
14 box.

15 BY MR. GOSS:

16 Q. The filter goes out a square and tips
17 somehow so that air can leak past it?

18 MS. ZIMMERMAN: Thank you.

19 THE WITNESS: Yes.

20 Did you get the wonky part?

21 BY MR. GOSS:

22 Q. You say, in summary, you believe that
23 the use of the Bair Hugger will adversely
24 affect the air quality in the OR and at the
25 patient, this will place the patient at

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2 increased risk of contracting an HAI. Is that
3 your testimony?

4 A. Yes. Yes, it is.

5 Q. Do you have an opinion that the Bair
6 Hugger is capable of causing a surgical site
7 infection? Not just increased risk, but
8 actually causing.

9 MS. ZIMMERMAN: Object to form and
10 foundation.

11 THE WITNESS: I have no information
12 that there is direct causality.

13 BY MR. GOSS:

14 Q. Would you agree with me that you can
15 put the cleanest air in the world into a room,
16 but if skin particles are falling off the
17 doctors and nurses into the surgical site,
18 that's a problem that can't be solved by the
19 HVAC system?

20 MS. ZIMMERMAN: Objection to form.

21 THE WITNESS: Yes.

22 Q. And that is a problem that exists
23 whether or not you have a Bair Hugger in the
24 room; correct?

25 A. Yes.

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2 MR. GOSS: That's all the questions I
3 have. Thank you for your patience.

4 MS. ZIMMERMAN: Should we take a real
5 short break?

6 MR. GOSS: Sure.

7 THE VIDEOGRAPHER: Off the record at
8 6:32 p.m.

9 (Thereupon, a brief recess was taken.)

10 THE VIDEOGRAPHER: Back on the record
11 at 6:40 p.m.

12 FURTHER EXAMINATION

13 BY MS. ZIMMERMAN:

14 Q. All right. Well, Mr. Koenigshofer,
15 as you know, I'm Genevieve Zimmerman. And I am
16 one of the lawyers who represents the
17 plaintiffs in a coordinated case in Minneapolis
18 called a "multi-district litigation".

19 And I'm going to have some questions
20 for you today as well. First, I just want to
21 say for the record, I appreciate your patience
22 with this process. I appreciate that it is
23 presently a quarter to 7:00 p.m. We have been
24 going all day in a very hot room, not under
25 ideal conditions.

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But do you understand that you have been offered by the plaintiffs as an expert witness in this matter?

A. Yes.

Q. And I'm going to ask you some questions about the report that you generated in connection with this case.

Would you agree to only offer those opinions to me that you hold to a reasonable degree of professional engineering certainty?

A. Yes.

Q. Now, you had a number of questions posed to you by counsel for defendants mixing in HVAC questions and questions about Bair Hugger engineering. Do you recall that?

A. Yes.

Q. And did you find the questions with respect to HVAC standards and potential medical device engineering standards to be confusing?

A. The mixing of the two, yes.

Q. So you were asked a lot of questions outside of your expertise. So what I'd like to do is go through your opinions for the court and for the jury in this matter. Is that okay?

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A. Sure.

MR. GOSS: Object to form.

BY MS. ZIMMERMAN:

Q. In addition, defense counsel went over a number of articles that you have never seen before. Do you recall that today?

A. Yes.

Q. And I would like to go through at least some of those as well; okay?

A. Okay.

Q. I'm going to start with Exhibit Number 5, which is your report. And I'd ask you to turn to page 3, if you can.

A. Okay.

Q. And here you listed the question presented that you were asked to explain the environment of use for the Bair Hugger device. And you defined that environment of use as the hospital operating room; is that right?

A. Yes.

Q. And you explained in your report that part of the question presented is to explain how an operating room ventilation system is designed to minimize the risk of particles in

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infection; is that right?

A. Right.

Q. And then, finally, the question presented in your report you note that you were asked to offer your opinion on the impact, if any, of the Bair Hugger device on the protective effect of the hospital HVAC system; is that correct?

A. Yes.

Q. And is it your professional engineering opinion that an operating room is designed to minimize particles and therefore infections?

A. Yes.

Q. And is it your opinions that the Bair Hugger effect on the operating room is to increase the rate of particles or the surgical site?

A. I believe that it will. Yes.

Q. And you are, as you understand it, here to offer opinions on the HVAC system in the operating room; correct?

A. Yes.

Q. You're not here to offer any

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microbiology testimony; is that correct?

A. That is my intention.

Q. And you're not here offering opinions on infectious disease, are you?

A. No.

Q. You'd agree that you're not an expert on infection rates; is that fair?

A. That is fair.

Q. And is it fair to also say you're not an expert in filtration design for a medical device?

A. That is certainly true.

Q. But you are an expert with respect to operating room HVAC systems and the reason behind them?

A. Yes. I feel I am.

Q. What is the purpose behind an operating room HVAC system?

A. Well, it's to provide the cleanest air we can possibly provide within financial restrictions.

Q. Your report talks about clearing a fly from a room; is that correct?

A. Yes. That is part of it. So we're

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going to provide fresh air to reduce odors. And if there is any residual anesthesia or something in the room. So we provide fresh air for that purpose. And then we just provide 20 air changes, which is a lot of air in a room to flush out bacteria or any particles that are generated within the room by any means. It is our effort to try to flush them out.

Q. So part of your job in -- in the HVAC system are designing those is to reduce particles; is that right?

A. Yes.

Q. And why is the reduction of particles important?

A. Well, I believe that most people, certainly within ASHRAE and our committee, feel like there is a correlation between particles and bacteria in the air.

Q. And do hospitals ask you in your capacity as an HVAC engineer to reduce those particles because they believe them to be a proxy for bacteria?

MR. GOSS: Object to form. Calls for speculation.

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THE WITNESS: Yes. I believe that that is their objective. It's certainly the objective of the German standard.

BY MS. ZIMMERMAN:

Q. In fact, is that why there is double filtration in the HVAC system?

A. That is exactly why there is double filtration in the HVAC system. That is why it's MERV 14 and not MERV 10.

Q. And in fact, it's MERV 14 after a MERV 7; correct?

A. That's right.

Q. And that's what called for by ASHRAE?

A. Yes. I think -- well, in a lot of spaces it's now 8, actually. It's augmented.

Q. I think that you just stated that in your professional circles there is a general understanding that the number of particles is correlated in some way to bacteria in the room; is that fair?

A. Absolutely. That is what --

MR. GOSS: Objection to form.

THE WITNESS: -- is pushing a big request for change by Kaiser Permanente to

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change from 20 air changes to a particle count, and let them vary the airflow based on particles, with the obvious implicit assumption that particles and colony-forming units are some in way related.

Q. As you sit here today, there is no specific equation that you relate to or have memorized that specifies the exact correlation between particles and colony-forming units; is that fair?

A. You couldn't do it. I mean, where are you? Are you in cave? Are you in -- you know, over the ocean? Are you in an OR? Are you in a dog pen? Are you in an Avian flu bacterial-laden place? It's going to be different everywhere.

Q. Are you familiar with the term "positive pressure"?

A. Yes.

Q. What is that?

A. It's where I put more air into a room than I take out of a room, with the objective to keep any bugs that are outside the room from

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coming into the room.

So, for example, it would pressurize an operating room typically, maybe a 300 CFM offset. It can supply and exhaust.

Q. In your opinion, are medical device companies required to look at the environment of use for a medical device company?

MR. GOSS: Object to form. Foundation.

Q. If you know.

A. I don't know.

Q. Would you expect a medical device company to look at an ASHRAE standard for an HVAC system?

MR. GOSS: Same objection.

THE WITNESS: Same answer. I don't know whether -- if you're doing a whole literature review, that would be one article that you might look at, if you were building something or other.

BY MS. ZIMMERMAN:

Q. Let me ask it a little differently, I hope. The HVAC system is a double filtered air; is that correct?

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A. Yes.

Q. And so given your experience and your training and your education, you have some degree of comfort about where that air is being drawn from and what it's being filtered through; is that right?

A. Yes.

Q. Would the same principles apply to some medical device that is sitting on the operating room floor?

MS. ZIMMERMAN: Object to form. Foundation.

THE WITNESS: I would hope so. When we design our operating room or any air handler in the hospital, we don't take the air off the ground, nor off the roof. We elevate it 3 to 6 feet, depending upon what the surface material is.

Q. The operating room HVAC uses a unidirectional airflow. You've had some questions about that today. Do you recall that?

A. Yes.

Q. Why is unidirectional airflow used in

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an OR?

A. Well, because particles are generated within an operating room. And the cleanest air we are going to find is coming from our diffuser array falling down. And to the extent that we can exclude particles entering my nice little rainfall, we can keep them away from the patient.

Q. You were asked also some questions about Dr. Said Elghobashi's report. Do you recall that?

A. Yes .

MS. ZIMMERMAN: I don't know if Dr. Elghobashi's report is technically an exhibit today. Have you marked that?

MR. GOSS: I haven't. I referred to what he cited in his report.

BY MS. ZIMMERMAN:

Q. And toward the end of his report I think that he draws, I think it's five conclusions -- four conclusions. Do you recall that?

A. Show it to me.

MS. ZIMMERMAN: Counsel, I think it

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appears -- it's Dr. Elghobashi's report starting at page 61, but it is Bates number BHDK250 is where the report starts.

Q. Dr. Elghobashi reaches some conclusions following his computational fluid dynamics analysis; is that right?

A. Yeah. Well, these are summaries. Yes.

Q. And you have no reason to disagree with the conclusions and the summaries that Dr. Elghobashi reaches?

A. I have no reason to disagree with them.

Q. You had some questions posed to you about ASHRAE 170.

A. Yes.

Q. Would you agree that the purpose of ASHRAE 170 is for the ventilation of healthcare facilities? Is that the purpose there?

A. Yes, that is.

Q. Do you know --

MS. ZIMMERMAN: I can refer you, I think it is Exhibit 13, if you want to look at it, Counsel.

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Q. Are you aware of anywhere in 170 that indicates that this -- the 170 Standard could be used for design of a medical device?

A. I'm positive that there is nothing in there that references medical devices.

Q. Thank you.

A. It's not something we've ever talked about in 30 odd meetings that I've been to.

Q. Going back to the OR and the HVAC system. Not only is the HVAC system filtered twice through either a MERV 7 or MERV 8, and then a secondary MERV 14 filter, but it's also recirculated air, is about 75 percent of the air?

A. 80 percent is recirculated. Yes.

Q. Does that mean that there have been multiple filtrations of some of the air that is in the HVAC system?

A. Yes. I mean, as a crude calculation, I mean, assuming perfect mixing and yada, yada, yada -- assuming perfect mixing, each puff of air will be filtered four or five times.

Q. As you sit here today, is your understanding of the Bair Hugger that it draws

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1 air from where?

2 A. From the floor. I have seen where
3 you can buy a stand to put it on. I have no
4 idea when those stands are used, how many were
5 used, what proportion they've used. I have no
6 idea about that.

7 Q. Have you ever heard a surgeon refer
8 to anything below the operating table as "dirty
9 space"?

10 A. Yes.

11 Q. To your knowledge, as you sit here
12 today, the Bair Hugger only has one filter; is
13 that right?

14 A. That is what my understanding is.
15 Yes.

16 Q. Do you understand that currently that
17 the Bair Hugger is -- has a .2-micron filter
18 that is described as high efficiency?

19 MR. GOSS: Object to form.

20 THE WITNESS: I have seen that in the
21 literature.

22 I would also like to add that the
23 Bair Hugger filter is before all the
24 mechanisms. In an air handler, the final
25

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1 filter is the last thing in them.

2 Q. On the distal end of the --

3 A. On the air handler.

4 Q. Why is that important?

5 A. Well, just in case we're throwing off
6 any particles, or grease, or dust, or soot, or
7 anything else off of the -- any component of
8 the air handling system, I'm going to catch it
9 in that final filter, and not blow it into the
10 operating room.

11 Q. So in case some of the ductwork, for
12 example, was contaminated?

13 A. Well, yes.

14 Q. And you have seen documents in your
15 work in this case that shows that the Bair
16 Hugger devices have been known to be
17 contaminated; is that right?

18 MR. GOSS: Objection. Leading.

19 THE WITNESS: I have seen literature
20 indicating swabbing of both the hose and
21 inside the device as a result of them in
22 bacterial cultures.

23 Q. You had some questions posed to you
24 by counsel for defendants about filtration
25

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1 measurements in a lab. Do you recall that line
2 of questioning?

3 A. Yes.

4 MR. GOSS: Object to form.

5 Q. And I think that you were presented
6 with Exhibits 27 and 28, which are both titled
7 LMS Technologies and seem to be ASHRAE test
8 standards that represents that it's to a 52.2.

9 A. Yes.

10 Q. Both were done in May of 2016; is
11 that right?

12 A. Yes. Well, I haven't found it yet,
13 but from my memory that all sounds correct.

14 Q. Did you see on documents 27 and 28
15 that the manufacturer of the filter is listed
16 as 3M?

17 A. It says it's provided by 3M.

18 Q. And then the manufacturer right
19 below, "test requested by 3M, manufacturer 3M";
20 is that right?

21 A. Sure is, yes.

22 Q. Is that consistent with materials
23 that you have been provided thus far in this
24 case?
25

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1 A. No. I have seen references to
2 Pentair. And they had some other name. That
3 same company had two different names.

4 Q. Porous Media maybe?

5 A. Maybe so.

6 Q. In any event, you suggested that it
7 would be more persuasive from a professional
8 engineering standpoint to have a test done in
9 situ; is that right?

10 MR. GOSS: Objection. Leading.

11 THE WITNESS: I feel very strongly
12 about that.

13 Q. And why is that?

14 A. Well, because I want to know how well
15 this filter seals in its seat in the Bair
16 Hugger. I expect that the cylindrical one
17 probably was sealed better. It's more rigid.
18 It doesn't warp as much as the flat one.

19 Furthermore, all of these, of course,
20 were done with brand new filters in a brand new
21 test lab facility, I assume. I don't know how
22 well this thing performs after 500 hours.

23 Q. Have you seen documents that suggest
24 at least the 505 series has -- has been known
25

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2 to leak?

3 A. I have seen e-mails to that effect,
4 yes.

5 Q. I would ask if you could open --

6 A. I have also seen where they were
7 inconsistent and some of them said, oh, well,
8 we had to do another test lot. First ones
9 leaked a lot, so we did another lot test. They
10 had bad adhesives or something or other.

11 Q. I would ask you to turn to your
12 binder of journal articles here in front of
13 you. I think we have a copy of it that is
14 marked as Exhibit 4.

15 Do you have an article in there with
16 the first author Reed?

17 A. I do. Yes.

18 Q. And have you read that study?

19 A. I have.

20 Q. Did they do any testing about the
21 filter efficiency in the Bair Hugger in that
22 study?

23 A. They did.

24 Q. What were their findings?

25 A. Well, they had 23 different Bair

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2 Huggers that they tested. And this is figure
3 2. Particles greater than .3 microns, the
4 cubic meter so it's a count, particle count
5 basis.

6 So on some -- you know, they have
7 reductions, as I went through the Bair Hugger.
8 But many of the bars are, you know, just
9 ballparking on here they look like they might
10 be 20 percent, 30 percent, 60 percent passing
11 through. And in one of them, there is actually
12 more particles coming out than went in on
13 number 22.

14 Q. Do you know, was this related to the
15 Bair Hugger 750 series?

16 A. Yes.

17 Q. Do you know, did they -- did they do
18 testing of particles both before the filter and
19 after the filter and coming out of the hose; is
20 that right?

21 A. Yes, they did.

22 Q. And what were the results?

23 A. They had a whopping number of
24 particles coming out of the hose.

25 Q. And you had some questions posed to

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2 you by defense counsel about filtration. He --
3 I believe that Mr. Goss asked you if you're an
4 expert in the design of medical devices, and
5 you'd agreed that you are not; is that correct?

6 A. That is correct.

7 Q. Despite that, part of your expertise
8 is to determine the filter that ought to be
9 used in an operating room ventilation system;
10 is that correct?

11 A. I'm on a committee that figures this
12 out. Yes.

13 Q. And that --

14 A. It's not up to me.

15 Q. But that is what you do for a living;
16 right?

17 A. That is what I do for a living. I
18 don't get money going to those meetings but...

19 Q. I'm going to turn back to Exhibit 15.

20 A. As we look at these different
21 testings, maybe it's someplace hidden in here,
22 I've not seen it, but how many did they test?

23 Q. Can you tell from the face of the
24 document?

25 A. I can't. I would like to know that

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2 they walked into a warehouse and had a blind
3 monkey pick out 15 of them, and those are the
4 ones that they tested.

5 Q. And is there any information on the
6 face of the test about the date of manufacture
7 of the filter?

8 A. Date of manufacture of the filter?
9 Quickly glancing through it, I don't see where
10 it says a date. Oh, manufacture, has the date
11 of the test.

12 Q. And is there anything you can see on
13 the face of the test results there that
14 indicates where or how the filter has been
15 kept, from whenever it was manufactured, to the
16 date of this test?

17 A. Certainly not.

18 Q. And I will represent to you that
19 there were some modifications at some point to
20 the filter media that were from the supplier.
21 Is there anything you can tell from this, from
22 the face of these test results of Exhibit 27
23 and 28 that shows what the medium of the filter
24 is?

25 MR. GOSS: Objection to form.

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Leading.

THE WITNESS: No. I can't tell. It refers to as white media. It is a fairly generic expression.

Q. Turning to Exhibit 15, which was this Kowalski article. Hospital Airborne Infection Control. Do you recall that?

A. Yeah.

Q. And is it your understanding that this article applies to HVAC systems; is that fair?

A. Yes.

Q. So it's not, as with the ASHRAE 170, it's not intended to govern the manufacture or design of medical design, to your knowledge?

A. That is correct.

Q. What is your understanding of the air quality on the operating room floor?

A. Well, I know the people wear little booties and they wear them out, and they wear them back in, and they go out into the hallway, and they walk around, and they come back into the operating room. And that the floor of the operating room is not considered to be sterile,

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just as the back of the surgeons is not considered to be sterile.

Q. So would you consider the air on the floor different than air that is coming out at the -- shall I call it -- the proximal end of the diffuser?

A. You can just call it a diffuser.

Q. Coming out at -- at the diffuser?

A. I would certainly say that, yes. Absolutely. Otherwise, I failed at my job.

Q. And would you agree, again, is it your opinion held to a reasonable degree of professional engineering certainty that it is likely that there will be more particles on the floor of an operating room than at the diffuser?

A. That would be my opinion. Yes.

Q. What's the basis for that opinion?

A. Well, I've certainly seen lots and lots of articles about all the skin particles that are shed by the doctors, squames, and staff in an operating room. And, again, if they are -- if you believe that they are 10 microns, and if there is not a whole lot of

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turbulence, then they are going to settle out in whatever that number was, eight minutes. And, you know, build up on the floor. It's not likely that the return over here would have sufficient velocity to suck particles off the floor and return them to the ones -- once they've hit the floor.

Q. And does your opinion in that regard hold the same for that air that is underneath the operating room table but not all the way on the floor?

A. Sure. I believe that the clinical type people consider anything below the surface of the table to be not the sterile area. I'm not a clinician, but I think that is what they say.

Q. And that's what they've told you in your line of work in trying to remove particles from an operating room; is that right?

A. Yes. Well, it's more, you know, just sitting around talking. It doesn't really change my design. Whether I'm talking about, this is not sterile and this is, I'm still going to put in the best air I possibly can.

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Q. Turning back to Exhibit 15, this Kowalski article, there was a chart or a table 8.2.

A. Yeah.

Q. Do you recall there is a list of potential pathogens, including viruses and various bacteria?

A. Yes.

Q. And then there's a -- it's a MERV filter model filtration efficiency percentage, which I think corresponds with the percent reduction of any one of these pathogens based the MERV filter. Is that about right?

A. Yeah. Is that from his book, or is that from -- which is this one? Yeah, this is from his book. When did he write this? I'm not sure if 52 existed when he wrote -- yeah, it did. 2012.

So yes, I would say he is cross-referencing. He is thinking MERVs and 52s there.

Q. So my question is, if just by way of example, staph aureus, which is a bacteria; correct?

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A. Yes. I believe so.

Q. If the chart here shows that a MERV 14 would remove 97 percent of staph aureus when properly filtered, how is that different from a HEPA filter?

A. Well, I'd have to look at all the numbers but the HEPA might be pulling out 99.9 percent.

Q. Is there a difference of 3 percent? It's about 3 percent?

A. It is about 3 percent. And 3 percent of a very big number is a pretty big number.

Q. Based on the air under the operating room table having a greater concentration of particles than in the HVAC system, do you have an opinion with a reasonable degree of engineering certainty about whether the filter that was used by the Bair Hugger allows 3 percent of bacteria to go through?

MR. GOSS: Object to form and foundation.

THE WITNESS: Even that, I'm going to have to ask you to ask the question again.

Q. Okay. And I've got it written down.

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Based on the testimony that you just provided about air that is underneath an operating room table is likely to have, in your opinion, a greater concentration of particles than air coming out right under a diffuser in an HVAC system.

A. Yes.

Q. Do you also have an opinion that you hold to a reasonable degree of engineering certainty about whether a filter used by the Bair Hugger, which allows 3 percent or more of particles to go through, whether that is appropriate? We can use staph aureus as an example.

MR. GOSS: Objection to form.

Leading. Assumes facts not in evidence.

Foundation.

Go ahead.

THE WITNESS: I would think that any device -- let's call it a Bair Hugger -- that sits on the floor is going to be challenged by more particles and bacteria than my air handler will be.

Furthermore, as you noted, my air

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handler will have a prefilter and a final filter. And the air will go through my filters four or five times, whereas they go through the Bair Hugger filter only once.

Furthermore, the filters that I put into an air handling unit are really, really rigid three-dimensional boxes with really good gaskets around them. They seal really tightly. I don't know how good the Bair Hugger thing seals, so I'm not fully convinced yet that in situ it really performs to MERV 14. I have not seen data that says that.

Q. In your report you talk about the environment of use as being the operating room; is that right?

A. Yes.

Q. And you would agree that knowing the environment of use is important in making decisions about filtration?

A. Important to whom?

Q. To whoever is making the decision about the filter.

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A. The filter on a Bair Hugger, or any filter? Where are we here?

Q. Start with the filter on an HVAC system. You have a different -- well, tell me if you do -- is there a different filtration requirement for a patient waiting room, for example, than as compared to an operating room?

A. Yes. There is different filtration requirements in different spaces.

Q. And why is that?

A. Because the feeling is that the OR patients are the most susceptible, vulnerable ones that you've got. I mean, maybe with the exception of your protective isolation areas.

Q. And some of that, likely, has to do with the fact that they have an open wound because they are having surgery; is that fair?

A. Yes.

Q. That operation room is the environment of use that you designed for your HVAC system; correct?

A. Yes.

Q. Is it your opinion held to a reasonable degree of engineering certainty that

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devices in the operating room should also be taking into account that environment of use?

MR. GOSS: Objection to form.

Foundation.

THE WITNESS: That they should be taken into account?

Q. They should know the environment that they will be used in.

A. Oh, those people -- the manufacturers of it? I would certainly hope so.

MR. GOSS: Same objection.

Q. You had some questions posed to you about other devices that are in the OR. Do you recall that?

A. Yes.

Q. There was a question or two about an electrocautery device. Do you recall that?

A. Yes.

Q. Have you ever been presented with any evidence that there is bacteria in the smoke coming from this device?

A. I don't know about bacteria, but certainly smoke.

Q. So is smoke a particle?

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A. Yes. I believe that smoke is an inorganic particle. I'm not sure that even inorganic is the right word for it. Nonviable. Let's put it that way.

Q. And as far as you know, as you sit here today, is it possible for bacteria or other pathogens, to attach themselves to whatever smoke is?

A. Sure.

Q. Do you have an opinion about that?

A. It could.

Q. You had some questions posed to you about lights in the operating room. Do you recall that?

A. Yes.

Q. Are you aware of any literature that indicates that the lights disperse bacteria?

A. No. All the studies relate to the convective motions.

Q. Same question with respect to surgical drills or saws. Are you aware of any literature that the drills and saws disperse bacteria?

A. I'm not aware of any literature about

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that.

Q. Are you aware, as you sit here today, of any other medical device that blows air at 48 CFM in an operating room?

A. I don't know what the airflow is on different devices for cooling purposes. I would say it's the only device that I know of that blows air toward, around, over, under the patient.

Q. With respect to that kind of heater/cooler machines, you would only expect those to be operating in a cardiac surgery; is it fair?

MR. GOSS: Objection. Leading. You can answer.

THE WITNESS: That is my understanding, that they are actually heating and cooling fluids.

Q. Are you aware of any device in the operating room that draws air from the floor and brings it towards the patient?

A. I'm not.

Q. Turning to Exhibit 16. It is the French study, Monitoring Air Sampling in

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Operating Theatres. "Can Particle Counting Replace Microbiological Sampling?"

Do you recall questions about that article?

A. Yes.

Q. And I recognize, if I recall your testimony correctly, you have not seen or read this article prior to today; is that correct?

A. That is correct.

Q. Do you recall from reviewing this document, when Mr. Goss posed questions to you, that the authors in this study only counted particles at .5 microns and above; is that right? If it would be helpful, I can refer you to the second page, six lines from the bottom on the left-hand column. "Particles greater than .5 microns were counted by means of a particle analyzer."

Do you see that? Page 2. Are we on the same article?

A. No.

Q. That will happen when you're on 7:20.

A. Are we supposed to be on 16 here? Okay.

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2 Q. 16.

3 A. Let's regroup. Okay.

4 Q. So you can see on the second page of
5 this article, towards the bottom left-hand
6 side, about six lines up, it says, "The
7 particles". Then they put in parenthesis
8 (greater than .5 microns) were counted by means
9 of the particle analyzer. Then they put in
10 parenthesis this met one, which I assume is the
11 particle count.

12 Do you see that?

13 A. Uh-huh. Yeah.

14 Q. Then on page 29, if you flip over to
15 the next page. It looks like it's -- actually,
16 we've underlined the same thing here. It says
17 that the cut-off value of 5 CFU per meter cubed
18 was specifically studied because it has been
19 defined as the threshold limit in French
20 guidelines; is that right?

21 A. Yes.

22 Q. Do you know whether or not Seal and
23 Clark find a correlation when counting
24 particles of 5 microns and larger? I will help
25 you by referring you over to the left-hand

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2 column.

3 A. "Seal and Clark demonstrated that
4 particles sized 5 to 7 correlated significantly
5 with microbiological contamination".

6 That's a nice quote.

7 Q. Thank you. I won't ask any more
8 about that.

9 A. That's a good one. I have to -- so
10 that's what I do. So now I will go read Seal
11 and Clark.

12 Q. Well, you've got it. So let's try to
13 keep moving. I think this is a long day for
14 everybody.

15 Moving on to Exhibit 17, which is the
16 one I think you had a minute ago. Can
17 Particulate Air Sampling Predict Microbial Load
18 in Operating Theatres for Arthroplasty? This
19 was a study done in 2012, and it looks like in
20 Italy.

21 So turning to page 6 of this, so that
22 backside of the article, looks like the very
23 end. I think it says, "The use of surgical
24 instruments that produce surgical smoke
25 increase particulates." Right-hand side, "In

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2 conclusion."

3 A. "In conclusion."

4 Q. "This study showed that the use of
5 surgical instruments that produced surgical
6 smoke, such as the ultrasonic scalpel, can
7 markedly contribute to the production of
8 airborne particulates."

9 Do you see that?

10 A. Yes.

11 Q. They go on further to show -- in
12 fact, I think that they cite to Stocks. They
13 do -- that there is, in fact, a correlation
14 between particles and CFUs.

15 MR. GOSS: Objection to form.

16 Mischaracterizes document.

17 BY MS. ZIMMERMAN:

18 Q. We can read the second paragraph.
19 How about that?

20 Then it goes on to says. "However,
21 one of the limitations of the present research
22 is that only two particulate fractions were
23 studied. We cannot, therefore, rule out the
24 possibility that there may be a correlation
25 between the number of particles per meter cubed

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2 and the CFU meter cubed, if particulate
3 fractions in narrower size ranges are
4 considered, as has been reported by Stocks, et
5 al."

6 Did I read that right?

7 A. Yes.

8 Q. And then they go further and say,
9 "Moreover, further investigation should be
10 carried out in operating theatres equipped with
11 laminar flow ventilation systems, an issue
12 which has not yet been sufficiently addressed
13 in studies of this kind."

14 Did I read that correctly as well?

15 A. Yes, you did. I guess the inference
16 there is that this was not a laminar flow OR.

17 Q. I think that's correct. I'm reading
18 those on the fly myself.

19 A. Okay. Good article to read in my
20 spare time.

21 Q. You had some questions posed to you
22 about Sharp in your citation to that in your
23 expert report. I will turn you back to
24 Exhibit 5. I think your citation on Sharp is
25 on page 18, number 6.

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Do you recall or do your notes reflect that the Sharp study was about the warm touch product and not about Bair Hugger?

MR. GOSS: Objection. Leading.

THE WITNESS: "Warming blankets -- [sotto voce].

Q. And if you want to look at Exhibit 4 where you have the Sharp article, can you tell me whether this study, whether the Sharp author studied Bair Hugger or a different product?

A. I think they were using like a Mistral or something.

Q. If it's a device called a "Warm Touch", would that be consistent with your recollection?

A. Yes. It is not a Bair Hugger.

Q. Right. This is another device that, in your notation on page 18 of Exhibit 5, looks like the Warm Touch product uses a HEPA filter; is that right?

A. Right. Sure, it says Warm Touch, in B.

Q. In your conclusion number C there, or letter C says, "The HEPA filter in the warming

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unit, therefore, appeared to be fully functional vis-a-vis high levels of the floor"; is that right?

A. Yes.

Q. I'd just like to turn briefly through your report.

A. Okay.

Q. You've been asked to provide an expert report about the environment of use, which is a hospital operating room; is that right?

A. Right.

Q. You provided a report in connection with your work in this matter; is that right?

A. Yes.

Q. And you expressed opinions in your report about the impact of an operating room ventilation system on minimizing particles; is that right?

A. Yes.

Q. I think your testimony today has been that a reduction in particles is correlated with a reduction in colony-forming units; is that fair?

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A. Yes.

Q. And a reduction in colony-forming units, in your experience and to your understanding, would be -- would correlate with the reduction in infection as well; is that fair?

MR. GOSS: Objection. Leading.

THE WITNESS: I think that is a fair expectation.

MR. GOSS: Calls for microbiological expertise.

BY MS. ZIMMERMAN:

Q. And you've outlined in your report requirements for the HVAC system for use in an operating room; is that right?

A. Yes.

Q. And you've provided citations in your report that support the opinions that you offer in this case; is that right?

A. I have.

Q. And in preparing this report you indicate that you have offered all opinions in the report to a reasonable degree of professional engineering certainty; is that

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correct?

A. Those opinions that are in this report, yes.

Q. And other than a few typographical issues that I think you discussed with Mr. Goss in the amendment to number 4 on page 23, or I think that you amended number 4 to say 48 CFM rather than a range of 50 to 100, do you stand by the remainder of your report authored in this matter?

A. Yes.

Q. And I see that you reserve the right to amend or supplement your report and the opinions if additional information becomes available to you.

A. Right.

MS. ZIMMERMAN: I don't have any further questions at this point.

FURTHER EXAMINATION

BY MR. GOSS:

Q. I just have one question about a comment that you made. I believe you said, in response to counsel's questioning, that the air only goes through the Bair Hugger filter once.

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 2 Did I --
 3 A. Yes, sir.
 4 Q. -- quote you correctly?
 5 A. Yes.
 6 Q. So are you saying that the air that
 7 comes out of the Bair Hugger never goes back
 8 into the Bair Hugger? In other words, does the
 9 Bair Hugger recirculate any air in the room?
 10 A. Yes. I suppose it does recirculate
 11 some of the air in the room. Sure.
 12 MR. GOSS: Okay. Nothing further.
 13 MS. ZIMMERMAN: That's it. We'll
 14 read and sign.
 15 THE VIDEOGRAPHER: Off record at
 16 7:28.
 17
 18 (Whereupon, at 7:28 p.m., the deposition was
 19 concluded.)
 20
 21
 22
 23
 24
 25

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1 KOENIGSHOFER
 2 I CERTIFY THIS IS A TRUE AND
 3 ACCURATE TRANSCRIPT FURTHER DEPONENT SAYETH
 4 NOT.
 5 _____
 6 THE WITNESS.
 7
 8 IN THE STATE OF
 9 NORTH CAROLINA
 10 Sworn and subscribed to before me this
 11 _____ day of _____, 2017.
 12
 13
 14 Personally known _____ or
 15 I.D. _____
 16 _____
 17
 18 Notary Public in and for
 19 the State of North Carolina at
 20 Large. My Commission Expires:
 21 June 14, 2021
 22 Commission No.: 201116700033
 23
 24
 25

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1 KOENIGSHOFER
 2 CERTIFICATE
 3 NORTH CAROLINA
 4
 5 I, the undersigned authority, hereby
 6 certify that the foregoing transcript, page 1
 7 through 352 is a true and correct transcription
 8 of the deposition of Daniel Koenigshofer, P.E.
 9 taken before me at the time and place set forth
 10 on the title page hereof.
 11 I further certify that said witness
 12 was duly sworn by me according to law.
 13 I further certify that I am not of
 14 counsel to any of the parties to said cause or
 15 otherwise interested in the event thereof.
 16 IN WITNESS WHEREOF I hereunto set my
 17 hand and affix official seal this 19th day of
 18 June, 2017.
 19
 20 _____
 21 RANDI GARCIA, COURT REPORTER, RPR
 22 NOTARY PUBLIC
 23
 24
 25

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1
 2 NAME OF CASE:
 3 DATE OF DEPOSITION:
 4 NAME OF WITNESS:
 5 Reason Codes:
 6 1. To clarify the record.
 7 2. To conform to the facts.
 8 3. To correct transcription errors.
 9 Page _____ Line _____ Reason _____
 10 From _____ to _____
 11 Page _____ Line _____ Reason _____
 12 From _____ to _____
 13 Page _____ Line _____ Reason _____
 14 From _____ to _____
 15 Page _____ Line _____ Reason _____
 16 From _____ to _____
 17 Page _____ Line _____ Reason _____
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 24 From _____ to _____
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